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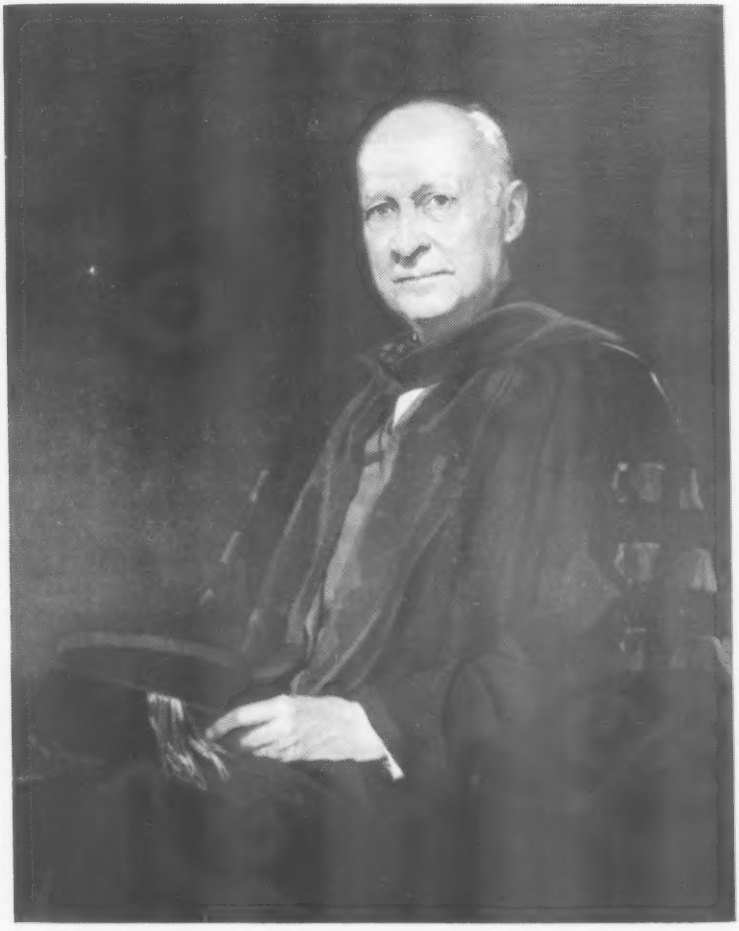

Editor's Note: Because of the outstanding contributions made to the Virginia Academy of Science and to this Journal by Dean Lewis, this number of the Journal is dedicated to him.

THE VIRGINIA JOURNAL OF SCIENCE

VOL. 5, NEW SERIES APRIL, 1954 NO. 2

Ivey Foreman Lewis

Ivey Foreman Lewis, Miller Professor of Biology and Agriculture, Dean of the University and Dean of the College of Arts and Sciences retired from active duty on July 1, 1953.

Dean Lewis was born in Raleigh, North Carolina on August 31, 1882. His parents were from families long associated with the development and advancement of that state. His father, an alumnus of the Department of Medicine of the University of Virginia, was a physician who became a specialist in diseases of the eye, ear, nose, and throat. He was instrumental in establishing the State Board of Health of North Carolina and was in charge of the program until his retirement in 1918. His mother was Cornelia Viola Battle the first daughter of Kemp Plummer Battle who was for many years President of the University of North Carolina.

Dean Lewis received his A.B. and M.S. from the University of North Carolina and his Ph.D. in 1908 from the Johns Hopkins University. At the Johns Hopkins University Dr. Lewis received the Bruce Fellowship. Here he worked under the great botanist Duncan S. Johnson and the outstanding biologist William Keith Brooks. The Doctor of Science degree was awarded Dean Lewis by the University of North Carolina in 1947.

In 1908 Dr. Lewis studied at the University of Bonn working under the botanist Edward Strasburger. During the same year he held the Smithsonian Table at the Stazione Zoologica at Naples.

During the session of 1905-1906 and again from his return from Europe in 1908 until 1912 Dr. Lewis served as Professor of Biology at Randolph-Macon College. In 1912 he became Assistant Professor of Botany at the University of Wisconsin where he remained for two years. The academic session of 1914-1915 was spent as Professor of Botany at the University of Missouri. Upon recommendation of the Miller Board of Trustees to the University of Virginia Board of Visitors Dr. Ivey Foreman Lewis was appointed Miller Professor of Biology and Agriculture beginning in September 1915. From that date until his recent retirement Dr. Lewis has served the University in many fields of endeavor other than as Professor of Biology. In 1934 he was appointed Dean of the University, served as Director of the Mountain Lake Biological Station from 1933 to 1946 and was appointed Dean of the College of Arts and Sciences in 1946.

For many years Dean Lewis was closely associated with the Marine Biological Laboratory at Woods Hole, Massachusetts. He became instructor in Botany there in 1907, served again from 1910 to 1917, and from 1918

to 1927 was instructor in charge of the botany course. He also served as Trustee and Member of the Executive Committee of the Marine Biological Laboratory.

Dean Lewis served as a member of the National Research Council from 1928 to 1932, was a member of the Executive Committee from 1930 through 1931, Vice Chairman of the Division of Biology and Agriculture in 1931 and 1932 and Chairman of the Division of Biology and Agriculture from 1933 through 1936.

He is a trustee of Biological Abstracts, Fellow of the A.A.A.S., has served as Secretary, Vice-President and President of the Botanical Society of America, President of the American Biological Society, and President of the American Naturalists. He is a member of Phi Beta Kappa, Omicron Delta Kappa, The Raven Society of the University of Virginia, and as a member of the Society of the Sigma Xi was most instrumental in having a chapter of that society established at the University of Virginia.

It was in December 1920 that Dr. Lewis founded the Association of Virginia Biologists, an organization which has been superseded by the Virginia Academy of Science. He was instrumental in organizing the latter in May 1923, and served as its first president.

The published works of Dr. Lewis are far too many to mention here. His first and most numerous publications were in algology. For his paper on "The Life History of *Griffithsia Bornetiana*" published in 1909 he was awarded the Walker Prize in Natural History by the Boston Society of Natural History. Other algal papers he considers of greatest interest are "Periodicity in *Dictyota* at Naples" published in 1910 and "*Oedocladium* in North America" published in 1921. The origin and development of plant galls has of recent years been the field of investigation receiving most of the attention of Dr. Lewis. It is hoped that in his retirement he will have more time to devote to this study.

Dean Ivey F. Lewis and his wife are now residing at their new home, "Rock Rib", Rugby Road, Charlottesville, Virginia.

B. F. D. RUNK
University of Virginia

Nutrition, A Young Science

R. W. ENGEL
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NATURE OF THE SCIENCE OF NUTRITION

The idea that there is a close connection between the food supplied to plants or animals and their well-being is the origin of the science of nutrition. The numerous references to foods in the Bible are testimony that nutritional well-being was an utmost concern to the ancient civilizations.

In the modern sense, however, nutrition is an infant science. Only a limited number of scientists were engaged in nutrition investigations as recently as 50 years ago; no vitamins had been discovered, and the sum total of our nutrition knowledge was limited to proteins, carbohydrates, fats, and minerals. In 1930, all food companies in the United States had only about 500 research workers employed on various short-term projects in foods and nutrition. This number had risen to 2800 in 1940 and to an estimated 7000 as of today. The 14-fold increase in research effort in foods and nutrition in less than 25 years emphasizes the tremendous recent surge of interest in this young science. In 1930, only three vitamins had been synthesized, and a clear understanding of their chemical structure was known for only two of these. Today the list has grown to at least 20 organic chemical compounds that are classified as accessory food factors or vitamins, and experimental evidence indicates that there are probably several more as yet uncharacterized.

The science of nutrition depends on many related scientific disciplines. Basically, however, there are two sciences upon which nutrition is founded: biochemistry and physiology. Both of these are applied sciences in the sense that newer findings in these fields rest upon the application of new information in the foundation sciences of chemistry, physics, mathematics, and biology.

Broadly, the science of nutrition deals with the processes involved in the consumption, digestion, assimilation, and utilization of food constituents by the living organism. It becomes clear that a thorough knowledge of physiology is necessary for an understanding of nutrition principles. Present day physiologists readily submit that aside from the physical measurements widely used in physiology (gas diffusion, voltage, pressure phenomenon, etc.) all other phases of physiology rest upon biochemistry. Dr. L. A. Maynard states that nutrition is a chemical process and its principles must be presented in chemical terms.

Editor's Note: We are pleased to present this invited article by Mr. R. W. Engle of the Virginia Agricultural Experiment Station.

With the exception of anatomy (the oldest of the medical sciences), physiology has traditionally maintained the position of having served as parent for all of the newer sciences that have become departmentalized with the growth of our knowledge of the function of living matter. Nutrition represents one of these younger sciences. One of the younger sciences which perhaps most nearly parallels the basic principles of nutrition is the field of pharmacology and experimental therapeutics. The American Society of Pharmacology and Experimental Therapeutics originated in 1908 and was composed of physiologists who were interested in the biological effects of chemical compounds. It is obvious that their interest closely paralleled the present-day concept of the nutritionist.

A prominent physiologist recently enumerated some great discoveries made in the past 40 years by pharmacologists. Among these were hormones, vitamins, anti-vitamins, antibiotics, toxins, acetylcholine, histamine, demerol, dicumerol, and heparin. An examination of the scientists associated with these discoveries would include such names as Baylis, Starling, Howell, Steenbock, Elvehjem, Hart, and McCollum; the first three were physiologists and the latter biochemists or agricultural chemists. If the pharmacologists claim these discoveries, then it must be admitted either that these men were pharmacologists or that the sciences in which their contributions were made are so closely allied to pharmacology that any attempt at scientific departmentalization appears futile.

Other young sciences that have developed from physiology (enzymology, cellular physiology, physiological chemistry, endocrinology, experimental pathology) are just as difficult to separate from the science of nutrition as is pharmacology.

In this country nutrition was departmentalized as a distinct science in 1928 when the American Institute of Nutrition was organized. The eight scientists who served on the Editorial Board of the *Journal of Nutrition* in that year when the first volume was published identified themselves about equally as being physiologists or chemists (physiological or agricultural). At present the Editorial Board is composed of one physiologist, five nutritionists or nutritional biochemists, and six biochemists. Thus, the growth of the science of nutrition is characterized by the replacement of physiologists by nutritionists or nutritional biochemists, and the term biochemist has largely replaced the term physiological or agricultural chemist.

THE BASIS OF NUTRITION

The manner in which physiology (as a medical science) and chemistry (as a science applied to agriculture) initially contributed to nutrition knowledge can be best illustrated by recalling briefly some of the early research workers who established modern nutrition. Justus von Liebig was a chemist, but since the science of chemistry in his time was young, he served as an apprentice to an apothecary. This did not satisfy him, so he returned to university life in Paris for further study. In 1824 he became professor of chemistry at Giessen and set up the first teaching

laboratory in chemistry in Germany. It is interesting to note that none of Liebig's immediate pupils were physiologists, yet many of his contributions were in physiology. His best known work deals with the "law of minimum". He reasoned that the mineral present in soils in least amount would limit the plants' growth and determine the harvest yield. In general, this law has been the basis not only for minerals but for all essential nutrients in both plants and animals and has served as the basis for the discovery of individual amino acids and vitamins. Upon this principle is based one of our greatest modern industries, artificial fertilizers.

The physiologists honored Liebig because he was an analyst who devoted his life to the systematic analysis of the organs and tissues of plants and animals. He thus had a great influence in furthering exact methods of investigation in medicine and physiology, yet it is said that he never conducted an animal experiment.

Carl Voit is often considered the originator of metabolic research. He was a student of medicine in 1854 where Liebig was professor of chemistry. After completing the medical course, Voit continued his studies under Jolly, a zoologist, Liebold, an anatomist, and Liebig, the chemist. He became professor of physiology at Munich in 1863. Unlike Liebig, who elaborated chemical methods for the analysis of animal tissues and excretions, Voit applied these methods to metabolism studies of the income and outgo of food ingredients in animals and men.

Max Rubner and Graham Lusk were both pupils of Voit; Rubner later became a professor of physiology at Berlin, and Lusk became a professor of physiology at Cornell University Medical School in the United States. Rubner is credited with the discovery that the heat value of the metabolism of the resting individual is proportional to the area of the surface of the body. Lusk accumulated the vast pool of data on human energy metabolism at the Russell Sage Institute of Pathology, Bellevue Hospital, New York, where a clinical calorimeter had been constructed for such studies. This task in itself called for the close cooperation of physicists as well as chemists.

The association between T. B. Osborne and L. B. Mendel is perhaps the outstanding example of teamwork effort toward the advancement of newer nutrition knowledge in this country. Osborne (1859-1929) was a chemist at the Connecticut Agricultural Experiment Station, Storrs, and Mendel (1872-1935) was a physiologist at the Yale University Medical School. Much of our present knowledge of the nutritional value of proteins is based upon the investigations of this congenial research team.

The need for collaborative effort in nutrition research was therefore fully recognized by the founders of modern nutrition science.

PRESENT DAY NUTRITION RESEARCH

In our modern scientific environment, the extensive departmentalization of young disciplines nurtured by physiology has much extended the degree of collaborative effort that is called for in nutrition investigations. A modern nutrition laboratory, for example, relies upon a microbiologist

for the perfection of growth-measurement procedures with micro-organisms for vitamin and amino acid assays of foodstuffs. The chemical microscopists and the experimental pathologists are collaborators in the establishment of detectable derangements in plants or animals that are attributable to nutritional disorders. The endocrinologists and geneticists are valuable adjuncts to the establishment of reliable animal populations for precise nutrition investigations. The cellular physiologists and enzymologists are concerned with the more fundamental questions of metabolic derangements which occur at the cellular level. Appropriate experimental design and intelligent interpretation of research results require the aid of the biometrist. Too often present day nutritionists have been so busy with how to grow animals or plants for maximum production benefit to agriculture that they have not had the opportunity for teamwork effort. The opportunity for teamwork effort with allied sciences as a more fundamental approach to nutrition studies has often had to be abandoned and the nutritionist has had to consent to the gathering of growth data in simple feeding trials. This approach has resulted in many valuable observations even though it has represented a practical approach to production problems in agriculture. Actually, it has resulted in a situation where the nutritionists' observations have often supplied the necessary catalysts for more fundamental studies concerned with isolation of nutritionally essential factors or their role in metabolism.

Vitamin B_{12} was isolated in this country and almost simultaneously in England in 1948. The isolation procedure was greatly facilitated in this country by an observation of a microbiologist working in the Poultry Husbandry Laboratory at Rutgers University, New Brunswick, New Jersey. This worker observed that anti-pernicious-anemia liver preparations contained a growth factor that was essential for the micro-organism *Lactobacillus lactis Dorner* (LLD), and that the activities of liver fractions for the organism were almost identical with their effectiveness as anti-pernicious-anemia agents.

Parallel observations by animal nutritionists served equally effectively as catalysts in the isolation of vitamin B_{12}, since they had clearly established that poultry production (maximum growth) called for supplementation of all-vegetable rations with small amounts of animal products, particularly liver. The further observation by nutritionists that vitamin B_{12} greatly reduced the choline requirement in animals stimulated the extensive studies that have implicated this vitamin as functional in the synthesis and transfer of labile methyl groups.

The great speed with which the cataloging of essential growth factors proceeded during the period 1930 to 1948 seems to have slackened. There are now about 50 nutrients that have been found to play a role in nutrition. How many more there will be is not known. Several additional growth factors for poultry have been postulated but it is generally felt that the list will not expand greatly in the future. This means that there will be and should be a greater effort extended toward the elucidation of function of nutrients in animal metabolism. It is in this area that a

teamwork effort with the various allied scientific disciplines should prove very productive.

Scientific knowledge, nutrition included, has always gone and will always be unappreciated unless it is applied to day by day practices. Recently in animal nutrition, scientific knowledge has been applied very rapidly toward improvement of production. As an example, within a matter of three or four years after the observation that vitamin B_{12} concentrates in the form of fermentation products contained an antibiotic that served as a growth stimulant for animals, the manufacturers of animal feeds in the United States were using about 15 million dollars worth of antibiotics as supplements in commercial animal feeds. The 10 to 20 per cent increase in growth rate of poultry and swine that is often observed as a result of feed supplementation with antibiotics represents a real economy in animal production. Often the increased growth is reported to represent more efficient production, i.e., more pounds of animal product per pound of feed eaten by the animal.

The use of antibiotics has become an accepted animal feeding practice when there is actually very little basic information available as to the exact mode of action of the antibiotics as growth stimulants. Present indications are that the antibiotics exert their growth-stimulatory effects by changing the micro-organisms that are naturally present in the gastro-intestinal tract of animals. It is immediately apparent that the teamwork efforts of nutritionists, biochemists, and microbiologists will be required for the effective pursuit of basic information regarding the role of intestinal micro-organisms in animal nutrition.

The question that may be asked is whether or not it is sound agricultural practice to increase animal production (growth rate) by including a drug in the feed when we still have much to learn regarding the mode of action of the drug as a growth stimulant. Are we on a sound basis when we substitute a drug for sanitation as a sound animal husbandry practice? It appears we are doing just that when recent evidence indicates that antibiotics stimulate growth only when the poultry houses have not been thoroughly cleaned.

WHAT DO WE NEED TO KNOW?

The soundness of our animal production practices rests upon fundamental knowledge of the mode of action of chemical compounds that influence animal growth or animal products obtained. The science of nutrition has reached the stage in its development where pressure of the establishment of identity of nutritionally important chemical compounds can give way to broader questions of the functional aspects of nutrients. This does not mean that the nutritionist has established all that can be learned in growth or production type experiments. Much of our knowledge regarding nutrient requirements is based on results with laboratory animals. Of the twenty-odd vitamins that are known to be necessary for animals we have information with respect to requirements in humans for only a few.

We should catalogue all the factors involved in the nutrition of animals, learn how to assay for these factors in our foodstuff, and then, in addition, determine the need of the factors quantitatively. That is a big problem, but it is the ultimate goal of any program for the development of fundamental knowledge in nutrition. Professor E. B. Hart, Chairman of the Department of Biochemistry at the University of Wisconsin, in 1939 suggested the foregoing in response to an inquiry, "What do we need to know?" This statement still applies since there are yet many gaps in our knowledge of nutrient requirements for man and economically-important animals.

If we should attempt to list broad nutrition problems that deserve research effort, we should mention the following:

(1) Influence of genetics on nutritional requirements of animals;
(2) Interrelationships of endocrine function and nutritional status of animals;
(3) Influence of nutrient intake by the host on the host-parasite relationship that are common to ruminant and non-ruminant physiology;
(4) Relation of nutrition to disease, particularly the long term or chronic effects of nutritional inadequacy or excess;
(5) Establishment of optimum nutrient intake information throughout the life span of animals and man;
(6) Maximum effective utilization of pasture and roughage type feeds as a means of increasing the efficiency of production of meat and milk;
(7) Importance of soil fertilization or soil treatment practices on the nutritional health of animals and man;
(8) Impact of nutrition on abnormal growth situations, such as neoplasia.

Many nutritionists could add to this list. Whatever the magnitude or number of the unsolved problems may be, it is obvious that, basically, the important ones call for the teamwork effort of all of the scientific disciplines that have as their objective the solution to the problem of *how plants or animals grow*. With this answer, we can do a better job of growing them.

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Observations on the Summer Behavior and Mortality of Box Turtles in Eastern Virginia

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Early reports on the habits and habitat of the common box turtle, *Terrapene carolina carolina* (Linné), contain a few good guesses and a number of confusing or erroneous views. While it is true that in some seasons this chelonian is "partial to dry woods" (Richardson, et al, 1877), the statement that it has a "particular dislike for water, and soon dies if placed in it" (Kingsley, 1885) is in error. As early as 1842 Dekay noted that in New York box turtles are encountered in swamps and moist places, but he erred in reporting "it never takes to water from choice, and indeed would be drowned if retained there". As many observers subsequently noted, the presence of box turtles in wet places in summer is the rule rather than the exception, yet in 1933 Ditmars reported the behavior of box turtles placed in water as "hysterical in gaining the shore".

Pope (1939) reported "although frequently found in dry woods, it craves a certain degree of moisture when the temperature is high. This is shown by the way great numbers seek large mud-holes, bogs, swamps, shallow ponds, and even the edges of deeper (fresh or salt) water during hot dry spells of midsummer". Evidence that even during the hot spells many box turtles do not seek water sites for aestivation is presented by Conant (1938a). He observed that during and after heavy rains "literally dozens of box turtles were seen on the roads" on summer field trips in southern Ohio, and experiments conducted on turtles "in captivity on hot days showed that specimens almost always left their burrows when their enclosure was sprinkled with a hose". The authors have observed in eastern Virginia that during summer months a woodland area may contain no observable box turtles during dry spells of hot weather, and may be shown to have a considerable population by checking the same region following a period of rain. Field observations have established that these turtles have emerged from terrestrial burrows, and in no case to date has it been clearly established that a box turtle has roamed from an aquatic "aestivation" site following a summer rain though it is likely this occasionally happens. Ewing (1933) points out that mating may occur at any time during the season of activity, but "is most frequently observed" either early in the season, or late in the season "particularly just after a rain". It has not been determined whether the emergence of terrestrial,

burrowing box turtles following periods of rain during the summer months is closely correlated with a breeding inclination, but the authors have not observed pairs in coitus in the field during the hot months.

McCauley (1945) writes that "during dry seasons — great numbers of specimens can be found buried in mud along streams and ponds with only the tops of their shell exposed". This observation has been frequently confirmed by the authors in Tidewater Virginia, where it is usual to find two or three specimens in the mud and water-filled road ruts near abandoned logging camps scattered over the lower York-James peninsula. McCauley (ibid.) adds, "by no stretch of the imagination can this species be considered at home in deep water. The ungainly shell and the legs adapted for a terrestrial existence render swimming, in the sense that it is performed by other turtles, impossible". As the box turtles enter shallow water during hot periods, however, they frequently either take in enough air to become buoyant or bury themselves under the water and mud at the edge of the aquatic area. Brimley (1943) reports a case of what appears to be true aestivation under water, in which he dug up a specimen that was buried deep in the mud of a partly dried up pool, in a habitat in which one might naturally expect a snapping turtle. The senior author encountered similar cases during July of 1950 and 1952 in the Williamsburg area of James City County, Virginia. On one occasion three adult-sized box turtles were found buried beneath the mud in a shallow road-rut pool two miles south-west of Williamsburg. In the case of each specimen the carapace was entirely beneath the mud, and the site of burial was beneath from one to three inches of water. On being exposed to sunlight and air following excavation, one specimen showed prompt activity and the other two remained inactive, with shells closed, for about 30 minutes. As Penn and Pottharst (1940) point out, "hibernation and aestivation in so far as the terms apply to box turtles can be loosely defined as states of torporous activity at low and high temperatures respectively". Neither Brimley (ibid.) nor the senior author evaluated the extent of torpor present in their buried and submerged specimens, thus proof that aestivation was involved is lacking, but if it was present, it was promptly terminated in some specimens by resumed activity following excavation and disturbance. In extensive observations on the midsummer activity of 75 captive specimens, Allard (1935) reports no "definite — period of inactivity" (either diurnal or nocturnal), stating that during hot periods specimens slept by day or night in tunnels in a large debris pile in their enclosure, and that "at no time, from spring to October, have the turtles shown any decided inclination to refuse food, although the hunger impulse naturally seems strongest in early summer. In observing the activity of 24 captive specimens during July, 1953 (a month in which 19 days have had temperatures above 90° F. in the Williamsburg area) there has been no period when the response to food or handling did not result in prompt activity by the turtle. Penn and Pottharst (1940) describe a difference between winter and summer dormancy in *Terrapene major* Aggasiz in the New Orleans area. They report that while the for-

mer was erratic, the latter was "sure to be at least diurnally periodic, subject of course, to interruption by a cooling rain or an abrupt drop in temperature". The authors feel this oversimplification of the concept of aestivation in box turtles needs substantiation since the periodic activity is also related to photic orientation, and in addition evidence of reduced metabolic activity during a period of non-diurnal midsummer inactivity has not been established for a number of specimens exposed to the same environmental stresses. Conant (1938b) provides a six year summary of reptiles collected in Lucas County, Ohio which shows that in the northern part of its range the hibernation of *Terrapene c. carolina* is not erratic, being continuous from November through April. Neill (1948) shows that the hibernation is erratic in the southern part of the range.

Carr (1952) summarizes midsummer activity in reporting "box turtles often burrow into moist soil or leaf mold during the hottest parts of the day or even seek water, where they may merely sit in shallow places and pass the hot spells or may swim in a desultory fashion or crawl about on the bottom; some may even bury themselves in the bottom mud during droughts". The authors have observed that, in the Virginia area studied, the burrowing activity and the migration to "seek water" do not coincide wtih the hottest parts of the day; they precede it. During the periods of highest temperature, activity of box turtles is minimal, providing the turtle has found a place of retreat from the heat.

If retreat from areas exposed to maximum heat is not managed by box turtles before the hottest parts of midsummer days occur, mortality due to excessive heat results. During June, 1953 new ditches were excavated on either side of Quarter-Pass Road (Rt. 619) one mile south of Williamsburg. The ditches were steep-sided, and during morning hours were exposed to full sunlight. On June 19 the senior author noted four heat-killed box turtles which had tried to cross the ditch, but had failed to escape due to the steep sides. On July 2, six additional victims were noted in the same area. The junior author reports an instance of a similar nature, in which two snapping turtles, ***Chelydra s. serpentina*** **(Linne)**, one painted turtle, *Chrysemys p. picta* (Schneider), and three box turtles apparently died due to excessive heat on June 27, 1953. The specimens were penned in an enclosure lacking water by two reptile enthusiasts in Hampton, Virginia. They remained in this enclosure from 7:00 A.M. to 1:00 P.M. in a sparsely shaded area, and by the latter hour the six specimens mentioned were dead, and one other was still living.

Neill (1948) reports that in Richmond County, Georgia, the erratic hibernation behavior of the box turtles expose them to the hazards of sudden cold spells, and that "vast numbers of the reptiles freeze to death—, and the woods are littered with their shells". The authors have also noted the remains and shells of many box turtles in the woods, but have encountered no evidence of death due to specimens being caught out of hibernation in Tidewater Virginia. They suggest that destruction of hibernating box turtles by predatory mammals can account for the winter deaths, and that one of the factors in midsummer death is excessive heat during drought

periods, in areas where the turtles find inadequate debris to retreat under, and ground too hard and dry for burrowing.

SUMMARY

1. Box turtles adopt aquatic and burrowing habitats during hot midsummer months; they are found both on land, and in water, either remaining at the surface, or buried under mud.
2. Specimens in terrestrial burrows emerge at any time of day during or following periods of rain.
3. Aestivation is uncommon in box turtles in eastern Virginia, since active feeding, wandering from burrows and ability to respond promptly to stimuli are retained during midsummer.
4. Activity is greatest during the coolest parts of the day — usually early morning hours in hot weather.
5. Mortalities have been noted among turtles unable to escape from direct sunlight and high temperatures during the late morning hours of hot days.

ACKNOWLEDGMENTS

The authors are indebted to D. A. Perry and J. C. Stump of Hampton, Virginia for information of the summer mortality of turtles under their observation.

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An Equation For Sigmoid Curves

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Data that lead to sigmoid curves are common in many branches of pure and applied science. Equations for such curves are usually desirable, particularly equations that represent close fits and permit easy differentiation so as to provide accurate slopes. In some instances the Gompertz and modified Gompertz equations (Davis, 1943: 57).

$$y = a\ b^{c^x} \qquad \text{and} \qquad y = \alpha + a\ b^{c^x}$$

meet these requirements; in others, these expressions do not fit the data well and, hence, are inadequate as a basis for analytical determination of slopes.

Many sigmoid curves, both normal and skewed, can be fitted satisfactorily by the equation

$$Of = \frac{x - x_1}{a + bx} \tag{1}$$

where $Of = \log \left(\frac{20\ y}{\log\ (100 - y)}\right)$, x_1 corresponds to $y = 0.1$, and a and b are the intercept and slope, respectively, of the straight line that results when $\frac{x - x_1}{Of}$ is plotted against x.

On differentiation, Equation 1 yields

$$\frac{dy}{dx} = \frac{a + bx_1}{(a + bx)^2\ S} \tag{2}$$

where $S = 0.4343 \left(\frac{1}{y} + \frac{0.4343}{(100 - y)\ \log\ (100 - y)}\right)$

Table I of Document No. 4188 [1] lists values of Of and S for values of y in steps of 0.1 unit from 0.1 to 20.0 and from 95.0 to 98.9, and in steps of 0.5 unit between $y = 20$ and $y = 95$. Linear interpolation suffices throughout the table.

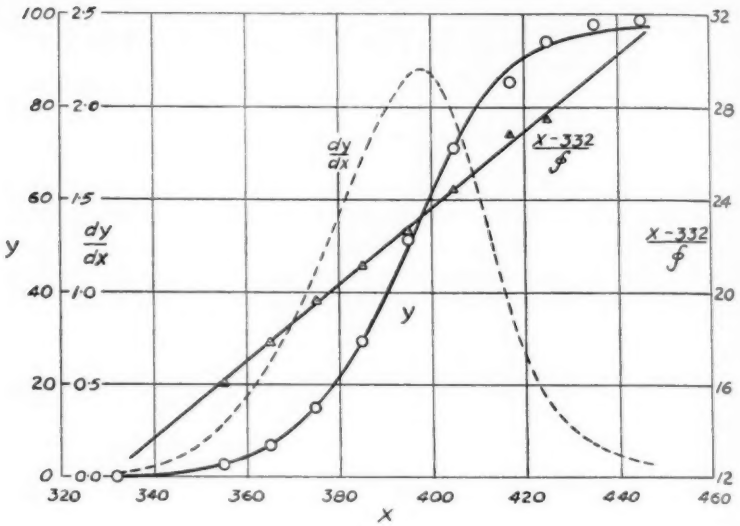

Fig. 1

Table II

Data of Gilliland and Baddour

y	x	x-332	$O\int$	$\frac{x-332}{O\int}$	$O\int$ calcd.	y, calcd.	Dev.	S	$\frac{dy}{dx}$
0.0	332	0	$-\infty$	0.00	0.000	0.1	0.1	4.343	0.019
2.7	355	23	1.434	16.04	1.422	2.6	−0.1	0.1662	0.285
7.0	365	33	1.852	17.82	1.851	7.0	0.0	0.06328	0.616
15.0	375	43	2.192	19.62	2.207	15.5	0.5	0.02913	1.121
29.4	385	53	2.502	21.18	2.508	29.8	0.4	0.01605	1.728
51.3	395	63	2.784	22.63	2.766	49.7	−1.6	0.01094	2.182
71.0	405	73	2.987	24.44	2.988	71.1	0.1	0.01058	1.960
85.5	417	85	3.168	26.83	3.218	88.3	2.9	0.02002	0.886
94.0	425	93	3.383	27.49	3.355	93.3	−0.7	0.03894	0.414
97.8	435	103	3.757	——	3.506	96.0	−1.8	0.08366	0.172
98.8	445	113	4.397	——	3.642	97.2	−1.6	0.1575	0.082

[1] Material supplementary to this article has been deposited as Document number 4188 with the ADI Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington 25, D. C. A copy may be secured by citing the Document number and by remitting $1.25 for photoprints, or $1.25 for 35 mm. microfilm. Advance payment is required. Make checks or money orders payable to: Chief, Photoduplication Service, Library of Congress.

The following example, which serves to illustrate the use of Equation 1 and of Table I of Document No. 4188[1], employs the data of Gilliland and Baddour (1953) where x is the volume of solution through an ion exchange bed and y is a ratio of concentrations, as presented in Figure 5a of their paper.

Plot the $x - y$ data of Table II to attain the solid sigmoid curve of Figure 1, note that x_1 (the value of x that corresponds to $y = 0.1$, substantially the same as that for which $y = 0$) is 332, and fill in the column in Table II that is headed "$x - 332$." Use Table I and enter in the $O\int$-column the value of $O\int$ that corresponds to each value of y, compute values of $(x - 332)/O\int$ and enter them in the column so headed. Plot $(x - 332)/O\int$ against x in Figure 1 and note that the points, enclosed in triangles, lie along a straight line. Divide the data into two equal parts (Davis, 1943:4), write the summation equations

$$74.66 = 4\ a + 1480\ b$$

and

$$101.39 = 4\ a + 1642\ b$$

to correspond to the general equation $\frac{x - x_1}{O\int} = a + bx$, and solve them simultaneously to yield $a = -42.395$ and $b = 0.16500$. From these values of a and b, find the calculated values of $O\int$, enter them in the column headed "$O\int$, calcd." and interpolate values of "y, calcd." and S from Table I. Plot the calculated values of y against x in Figure 1 and note how closely the curve represents the original plotted data. Use Equation 2 and the values of S to compute $\frac{dy}{dx}$, the slope of the sigmoid curve. Plot these slopes as the dotted curve in Figure 1.

This method for determining the equations of sigmoid curves has also been applied successfully to normal and skewed data in the fields of size separation, distillation, and atomic heat capacity.

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A Rapid Slide Screening and Diagnostic Test for Newcastle Disease

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Much has been learned about viral hemagglutination since the report of Hirst (1941) that influenza viruses agglutinate chicken red blood cells. Hirst (1942) reported that erythrocytes which had been agglutinated by influenza virus, strains PR8 and Lee, subsequently could be dissociated from the virus. After dissociation, the erythrocytes were no longer capable of adsorbing a detectable amount of fresh virus of either strain or a mixture of the strains or of agglutinating in their presence. He suggested that this hemagglutination phenomenon of the erythrocytes might be an *in vitro* counterpart to natural infection.

Hirst (1942 & 1949) suggests that the agglutination phenomenon is due to receptors on the red cell. He states that the virus attaches itself to the red cell receptor, and after four to six hours it is eluted from the cell, removing the receptors by enzymatic action. Since, there are no receptors left on the cell for the virus there is no agglutination when fresh virus is added to the resuspended cells.

These suggestions and statements were the basis for this study. This investigation was concerned with an *in vivo* alteration of the agglutinability of the erythrocytes when they come in contact with Newcastle disease virus. Forty-six young chickens of various breeds were inoculated with Newcastle disease virus and agglutination tests were run, observing the changes in sensitivity or agglutinability of the erythocytes as the disease progressed.

The ultimate aim of such a study was to apply this change of agglutinability of the chicken red blood cell to a rapid diagnostic test for the presence of Newcastle disease virus.

MATERIALS AND METHODS

Virus.—The virus used in this investigation as the agglutinating agent was a very mild strain of Newcastle disease obtained from Dr. F. R. Beaudette of the New Jersey Experiment Station, which had had its 75th egg passage. This virus strain is now known as the B1 or Blacksburg strain (Hitchner and Johnson 1948).

Preparation of the virus strain.—The virus strain was prepared by inoculating 0.1 ml. of infected allantoic fluid into the allantoic sacs of 11 day old chick embryos. After 48 hours incubation at 37° C. the eggs were placed at 4° C. overnight, and blood free allantoic fluid was removed the following day. If necessary the cellular debris was removed by a

short centrifugation, and the virus stored at 4° C. in the fluid state. The virus was formalized with 0.1% formalin a week before use.

Red Cells.—Red cells were obtained by venal puncture of the wings of the experimental chickens.

Agglutination.—A loop of whole blood, approximately 0.004 ml. in amount was mixed with 0.05 ml. of the prepared B1 virus on a glass plate, over a light source. This plate was divided into squares of 2.5 cm. The loop used to remove the whole blood was made of nichrome wire gauge 26 (Brown and Sharp) with a diameter of 0.4 cm. The drop of blood and the virus strain was mixed with the loop 25 times. The plate was then gently rotated and after a few seconds the test was read.

Reading the test.—An agglutination, even that just discernible with the naked eye indicates the absence of the virus of Newcastle disease. No agglutination whatsover is an indication of the presence of Newcastle disease.

RESULTS AND DISCUSSION

It has been found that blood serum from non-infected chickens (those whose whole blood was agglutinated in the rapid slide test) will give a negative test when submitted to the standard hemagglutination-inhibition (HI) test, and in most cases a positive HI when the serum was obtained from blood that failed to agglutinate in the rapid slide test. One hundred and eighty cases were positive with the HI while one hundred and eighty-nine showed absence of agglutination with the rapid slide. Comparative results obtained are shown in Table I. This discrepancy is attributed to the assumption that the rapid slide whole blood test picks up Newcastle disease reactors quicker than the HI. During more than four years of very close observation this assumption has proven true, as shown in the following paragraph.

For more than four years the rapid slide whole blood test has been used in the Regional Diagnostic Laboratory at Accomac, Virginia, as a screening and diagnostic test in detecting Newcastle disease in broiler flocks. One thousand one hundred and forty-four birds from four hundred and seventy flocks have given a positive test for Newcastle disease with the rapid slide whole blood method. More than two thousand birds from at least one thousand individual flocks have given a negative test with the rapid slide whole blood test. All of these flocks were checked from time to time, and in each case where the disease was diagnosed by the rapid slide method, symptoms or syndromes of Newcastle disease developed within a week, or less.

TABLE I.—Comparative Results Obtained from 38 Lots of Chickens with HI and Rapid Slide Methods

	HI		*Rapid Slide*	
Lot No.	*Birds Positive*	*Birds Negative*	*Absence of Agglutination*	*Agglutination*
1.	6	0	6	0
2.	6	0	6	0
3.	0	6	0	6
4.	0	3	0	3
5.	6	0	6	0
6.	0	4	0	4
7.	5	1	6	0
8.	6	0	6	0
9.	6	0	6	0
10.	6	0	6	0
11.	6	0	6	0
12.	5	1	6	0
13.	5	1	6	0
14.	6	0	6	0
15.	6	0	6	0
16.	6	0	6	0
17.	6	0	6	0
18.	0	3	0	3
19.	0	6	0	6
20.	0	6	0	6
21.	6	0	6	0
22.	3	3	6	0
23.	6	0	6	0
24.	6	0	6	0
25.	6	0	6	0
26.	6	0	6	0
27.	6	0	6	0
28.	6	0	6	0
29.	6	0	6	0
30.	4	2	6	0
31.	6	0	6	0
32.	6	0	6	0
33.	6	0	6	0
34.	6	0	6	0
35.	6	0	6	0
36.	6	0	6	0
37.	4	1	5	0
38.	4	0	4	0
Totals	180	37	189	28

SUMMARY

A rapid slide whole blood test for the screening of Newcastle disease reactors in chickens has been described.

Employing this method, a Newcastle disease reactor could be diagnosed in about two minutes.

The method has been used successfully for more than four years in diagnosing one thousand one hundred and forty-four cases of Newcastle disease in four hundred and seventy flocks.

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The Origin of Branching in the Aerial Shoot of *Psilotum nudum*[1]

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There are conflicting reports in the literature regarding to rather pertinent aspects of the developmental morphology of *Psilotum*. The first of these is concerned with the presence or absence of appendages in the axils of the ramifications. Prantl (1876) reported that an appendage is present below each point of bifurcation in *Psilotum*. From this he concluded that branching could not be dichotomous, but that one of the two branches was in the axil of an appendage. Solms-Laubach (1884) reported that appendage position was not regular in regard to branching. Ford (1904) and Stiles (1910) both report that in *P. flaccidum* an appendage is always associated with a dichotomy and that occasionally the appendage may be "carried up" by differential growth.

The second aspect on which conflicting reports have been published is concerned with the role of the apical cell in dichotomy. Solms-Laubach (1884), speaking of both *Psilotum* and *Tmesipteris*, asserts that in dichotomy the single apical cell may either divide medianly into two, or it may disappear altogether before bifurcation. Pritzel (1902) states that bifurcations take place as the result of the splitting of the whole apex into two, whereby the old apical cell disappears. Ford (1904) reported that the apical cell is not always present in recently forked branches, but may develop later.

External aspects.—When a rhizome apex of *Psilotum nudum* (L.) Beauv. is exposed to light it turns upward and becomes green. Small scale-like appendages are produced from the apex in a leaf-like fashion (fig. 17). These are very small, sparse and irregular in distribution on the apex. They appear to arise at a considerable distance from the summit of the apex. A lateral expansion of the region immediately below the apex appears, giving a club-shaped appearance to the young shoot. A period of rapid production of scale-like appendages associated with some growth in length of the axis soon follows. The apex is eventually hidden by overlapping appendages (fig. 16). Up to this stage of development the appendages have become progressively larger, closer to each other, and closer to the summit of the shoot apex. The young aerial shoot may be ca. 2 cm in length at this stage. No external manifestation of branching is evident, but if the appendages are removed and the apex is examined from above with moderate magnification one or more dichtomies may be observed (fig. 14).

[1] This represents a portion of a Ph.D. thesis submitted to the Botany Department, University of Minnesota. The writer wishes to thank Dr. E. C. Abbe and Dr. H. P. Banks for their suggestions and criticisms.

The shape of the apex following the stage shown in fig. 17 departs from the circular cross-section to become elliptical. The two ends of the flattened apex later become slightly raised above a central fissure. Situated at the outer edge of the central fissure is an appendage primordium. The two resulting new apices, also elliptical in cross-section, both divide as did the mother apex and again an appendage primordium is located at the outer edge of each of the two new fissures. This manner of branching may continue until the first four sets of dichotomies are initiated (i.e., until as many as 16 new apices are formed). At this stage the entire apex of the young aerial shoot may still appear similar externally to the one shown in fig. 16, or it may show some evidence of lateral expansion beneath the cover of the appendages. The vertical distance from the base of the first formed fissure to the most distal portion of the last-formed apex may be as little as 0.5 mm.

The appendage-dichotomy relationships are also illustrated in fig. 15 which is an outline drawing of a longitudinal section of a young aerial shoot. Appendage 1 is inserted at the outer edge of the axil of the first bifurcation which is in the plane of the diagram. Appendages 2a and 2b are inserted each at the outer edges of the axil of one of the second order bifurcations which are perpendicular to the plane of the diagram. Appendages 3a and 3b are each inserted at the outer edge of the axil of one of the four third-order bifurcations.

In figs. 1-12, the appendage-dichotomy relationships are also shown. The total vertical distance between fig. 1 and 12 is 2.5 mm. A total of four orders of branching is represented as indicated by the numbered appendages.

The following stages are characterized by a pronounced growth in the length of the inter-dichotomy regions resulting in the separation of the appendages from the dichotomies with which they were associated by as much as 4 cm. Slight differentials may be introduced during the period of most rapid growth in length so that an appendage which was originally in the axil between two branch primoridia (apices) may be shifted in position to a point slightly to one side of the axil or even slightly above it.

The present study has shown that in *Psilotum nudum* an appendage is present in the axil of each of the bifurcations which are initiated in the aerial shoot shortly after it has emerged from below the substratum.

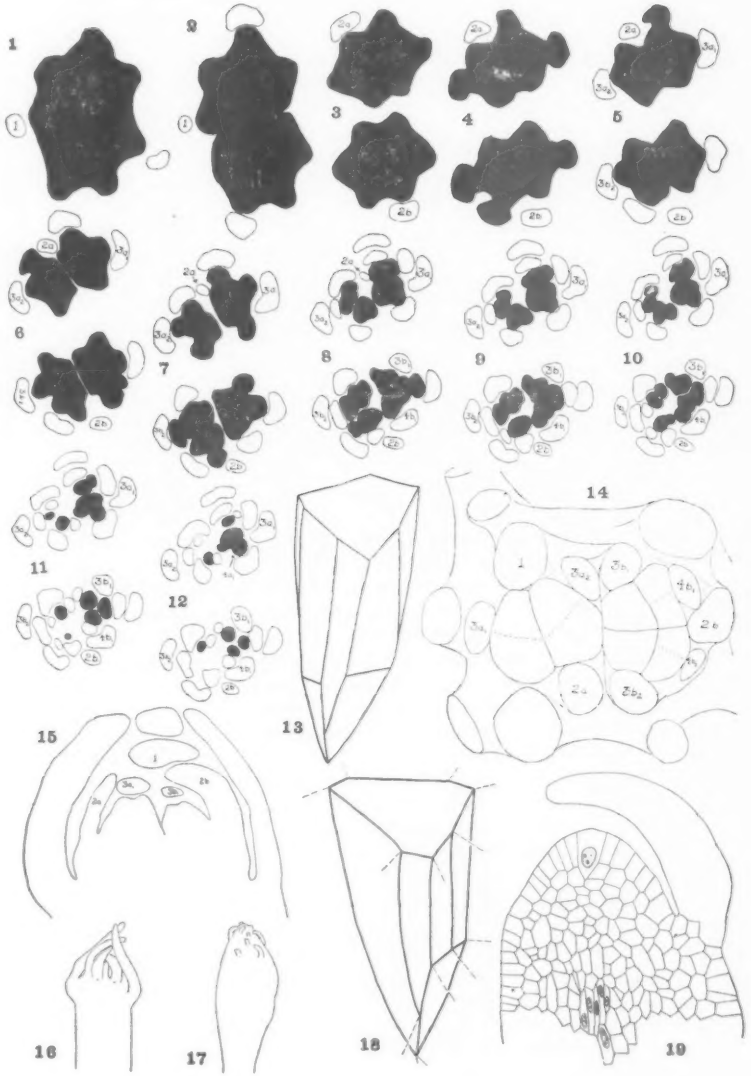
Hofmeister (1851) proposed that the growing apex is usually stable when it is circular in outline and that the apex will tend to re-assume a circular outline folowing an event which disturbs this condition. This hypothesis, which was also adopted by Schoute (1936), seems to be diagrammatically applicable in the case of *P. nudum*. The event which tends to disturb the circular outline of the shoot apex is the production of an appendage primordium. The tendency of the shoot apex to re-assume a circular outline is manifest by the production of two new growth centers in the apex, i.e. a bifurcation. Trifurcations are produced when three appendage primordia are produced in such a fashion as to result in a trilobed apex.

The first three or four orders of branching appear to be produced in rapid succession. The original apex seems to "explode" in their production. This establishes a lower system of nearly symmetrical dichotomies.

In the lower symmetrical system, the branching pattern is often regularly decussate. Bifurcations of the same order are generally situated at the same level. Where trifurcations are represented in the second or third order ramifications, they are usually duplicated or quadruplicated, thus preserving the symmetry of the system. Several shoots were observed which exhibited trichotomies at the two corresponding points of second order ramification, one which exhibited trichotomies at the four points of third order ramification and one which showed this type of branching at the point of first order and at the three corresponding points of second order ramification. Trichotomies are rare and occur at only about 5% of all points of branching.

Distal to the first set of dichotomies (the first 3 or 4) there is a region which exhibits less regularity. Here there may be two to four systems of dichotomies, but not corresponding in position on the various branches of the system, i.e., the inter-dichotomy stem units of similar orders vary in length. Their origin is considerably later in time than the first set. Definite appendages in this region cannot be associated with particular dichotomies. Fertile appendages are present only in the distal irregular system. The individual branches in the distal system almost regularly have three ridges, and relatively abundant appendages arranged in a 1/3 phyllotaxy.

Explanation of figures.—*Figs.* 1-12.—Camera lucida diagrams of cross-sections through the tip of a branching shoot of ***Psilotum nudum***. The sections are in serial order and cover a longitudinal distance of 2.5 mm. from the most distal (*fig.* 12) to the most proximal (*fig.* 1). *Figs.* 13 and 18.—Three dimentional views of two apical cells from the aerial shoot of *P. nudum*. *Fig.* 14.—Diagram of the top view of the apex shown in *fig.* 16 with some of the appendages removed (see text). *Fig.* 15.—Diagram of a median, longitudinal section of the apex of a young aerial shoot of *P. nudum* about 2 cm. above the ground level. *Fig.* 16.—Diagram of the apex of a young aerial shoot of *P. nudum* about 2 cm. above the ground level. *Fig.* 17.—Diagram of the apex of a young aerial shoot of *P. nudum* at or just above the ground level. *Fig.* 19.—Camera lucida drawing of a median longitudinal section of a shoot apex of an aerial shoot of *P. nudum* after the establishment of the proximal orders of ramification. The apical cell and the procambial cells are shown with nuclei. The labeling system used for the appendages in *figs.* 1-12, 14, and 15 is as follows: appendage 1 is inserted at the outer edge of the axil of the first order ramification; appendages 2a and 2b are inserted each at the outer edge of one of the axils of the two second order ramifications; $3a_1$, $3a_2$, $3b_1$ and 3b similarly of the four third order ramifications, *etc.* Unlabeled appendages are those which are not primarily associated with branching.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The shoot apex of Psilotum nudum.—The apex of a very young aerial shoot has essentially the same structure as that of a rhizome. When it becomes green the structure and activity, however, change considerably. The surface cells located at the summit of the apex divide more frequently in an anticlinal plane and soon the apical cell, still three sided, departs from its previous broad wedge shape and approaches somewhat the narrower columnar shape of the adjacent superficial cells as viewed in a longitudinal section. Following the establishment of the proximal symmetrical system of dichotomies, the apical cell in each of the ultimate apices is again broad and wedge-shaped (fig. 19).

The anticlinally elongate superficial cells, which are adjacent to and derived from the apical cell, divide to produce isodiametric cells on their inner sides (fig. 19). These cells divide essentially transverse to the stem axis to result in the production of several rows of cells immediately below the apical cell which give rise directly to a solid procambial strand in the center of the axis. Where a relatively small procambial strand is produced, those cells which in other stems give rise almost exclusively to the procambial strand may in addition contribute to a small extent to the formation of the cortex. Where a relatively large procambium is produced, e.g., in aerial shoots before the initiation of the first set of ramifications, the procambium may be derived not only from the inner cells cut off from the first derivatives of the apical cell, but also from inner cells cut off from superficial cells two or three cells removed from the apical cell and to some extent from second inner cells cut off from the first derivatives of the apical cell.

Periclinal divisions in the surface layer are frequent within about ten cells of the apical cell. From this point periclinal divisions are rare. They may, however, occur so late that the differentiated epidermis may occasionally be two cells thick. Ford (1904) reports that each cell which is cut off from the apical cell divides by a tangential wall into an inner and an outer cell, the outer layer thus produced forms the dermatogen. This early establishment of the protoderm, or dermatogen, adjacent to the apical cell has not been confirmed. In view of the late periclinal divisions in the superficial layer, a protoderm cannot be considered as present at all.

The cortex is derived in the same manner as is the procambium, except primarily from superficial cells which are more than one cell removed from the apical cell.

In order to view the exact 3-dimensional shape of the apical cell, two models (fig. 13, 18) were constructed of different apical cells. Each model was constructed as follows. A camera lucida drawing of each section in a serial cross section of an apical cell was made on a stuff card. The apical cell measured 80 μ in length and the sections were 8 μ thick, so that 10 cross sectional drawings were used in each model. The drawings were made using the oil immersion objective and in each case the upper focal plane of the section was drawn. Each drawing was then cut out of the card and the drawings were arranged in order. The model

was then built around the drawings as forms, so that the original drawings were on the inside of the completed model in their proper positions. Of the two apical cells reconstructed one had a total of 11 sides while the other had 10. Each had three obvious cutting faces.

Immediately after the first set of dichotomies is initiated in *Psilotum nudum* when little or no external manifestation of branching is evident, the eight or sixteen new apices are distributed uniformly over the summit of the old apex which may be expanded very slightly or not at all. If the original apical cell of the undivided mother apex had played a direct role in giving rise to the new apices, the new apices would necessarily have to be clustered on the central portion of the dome of the old apex. It is therefore concluded, not only from evidence offered by the spatial arrangement of the daughter apices, but also by the failure to find any direct histological evidence to support a direct role of the apical cell in dichotomy, despite critical examinations of a number of serial cross sections, that the apical cell does not play a direct role in the ontogeny of the first set of dichotomies. In the development of subsequent dichotomies, each pair of new apices produced is often situated quite close to the summit of the mother apex and frequently each apical cell is situated quite close to the inside of the young primordium, so that the spatial arrangement suggests that the apical cell of the parent apex divided medianly to establish the apical cells of the two daughter apices. It is possible to accept Solms-Laubach's (1884) interpretation as applied only to the ontogeny of those dichotomies of the distal irregular branching system of the aerial shoot and Pritzel's (1902) interpretation as applied to the earlier formed ramifications.

SUMMARY

In the growth of the aerial shoot of *Psilotum nudum*, the lower orders of ramification are initiated in rapid succession, nearly simultaneously. This is accomplished by division and subdivision into twos (or threes) of the apices before any appreciable elongation of the inter-dichotomy (or trichotomy) stem units has taken place. In the axil of each bifurcation there is present an appendage primordium which may later be shifted in position to a point to one side or slightly above the axil. Following Hofmeister (1857) and Schoute (1936), the shoot apex is considered stable when circular in outline. After an event tending to disturb this condition (i.e., the production of an appendage primordium) the shoot apex will readjust by division into two new apices. Three appendage primordia are concerned in the initiation of a trifurcation. The apical cell does not play a direct role in giving rise to new apical cells in connection with the initiation of the lower orders of ramification, but may do so in the initiation of the distal orders.

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News and Notes

(*Editor's note*: *News contributions should be sent to the person whose name appears at the end of the appropriate section.*)

MINUTES OF THE COUNCIL MEETING, CHARLOTTESVILLE, NOVEMBER 8, 1953

A meeting of the Council of the Virginia Academy of Science was held in the office of President Gwathmey, Cobb Chemical Laboratory, University of Virginia, Charlottesville, at 10:30 A.M. Present were: Walter S. Flory, Jr., President-Elect I. G. Foster, Horton H. Hobbs, Guy W. Horsley, Ladley Husted, Paul M. Patterson, Marcellus Stow, Stanley B. Williams, Fred Young, and Foley F. Smith. President Allan T. Gwathmey presided. First order of business was reading of the Minutes of the last meeting of the Council in May 1953, Lexington. The Minutes were approved.

President Gwathmey discussed the desirability of a meeting of all Section Chairmen and Secretaries; to discuss arrangements for the Annual Meeting of the Academy, May 6, 7, 8, at the University of Virginia, and it was decided to call a meeting of these officers sometime in January.

I. G. Foster made a brief report of the meeting of the committee appointed by President Gwathmey to study the operation of the Junior Academy of Science.

Marcellus Stow made a brief report for the Committee on Secondary School Science Teachers, and also suggested that the date and place of the Annual Meeting of the Academy be placed on the Secondary School calendar which is sent to all high schools in the State. In this connection Walter Flory commented on the new consolidated school in Clarke County and its inadequate facilities for science teaching.

Guy W. Horsley reported on plans for raising money for the operation of the Junior Academy of Science. It was suggested by this committee that a new class of membership in the Academy be created; to be known as a "Business Membership"; dues for which will be $100.00 per year. A special letter will be written to invite certain business and industrial firms to join the Academy on this basis. The revenue from such memberships is to be used for the annual operation of the Junior Academy and Science Talent Search, and for such other purposes as the Council may direct.

As this would require a change in the Constitution, motion was made and passed, that such a class of membership be established, and that publication of these minutes in the Virginia Journal of Science would constitute notice of such a proposed change in the Constitution. Article III of the Constitution: "Members" will now have an addition, Section 6, "Business or industrial organizations which pay dues of $100.00 annually,

shall be Business Members of the Academy. Such dues will be used in the annual operations of the Junior Academy of Science, and the Science Talent Search; and other similar purposes as directed by the Council."

Walter S. Flory reported for the Research Committee that approximately $1,000.00 would be needed for the present requests for grants-in-aid, and continuation of the Dismal Swamp project.

Marcellus Stow commented on the status of this project and said that he felt the book would be ready for publication next year, and that there would be no need at this time for any further grants-in-aid for this purpose, but any such request should be left to the decision of the Research Committee.

The Secretary-Treasurer reported that two thousand dollars previously carried in the Research Fund checking account had been turned over to the Trust Department of th First and Merchants National Bank, Richmond, for short term investments, so that some income could be derived from this money not needed at present by the Research Committee.

The Secretary also noted the necessity for decision on the billing date of the Academy, due to the change in the fiscal year from May 1 to April 31 to the calendar year. This would mean that members who have paid in advance have paid to January 1, 1954. It was decided that billing would be for the 1954 calendar year, and that May 1953 to January 1, 1954 be termed a year as far as dues are concerned.

Mr. Young, of the University of Virginia Chemistry Research Staff, Chairman of the Local Committee on Arrangements, reported on the plans of this committee for the next annual meeting. It was noted that Russell Rowlett, of the Virginia Carolina Chemical Company, Richmond, has been appointed Chairman of the Publicity Committee for this meeting.

A request from the Department of Geology of V. P. I. for $650.00 towards the publication of a booklet on "Virginia Minerals and Rocks" was acknowledged. It was decided that such a request could not be granted at this time.

It was decided that at the Annual Meeting the senior program would be suspended from twelve to one on Friday in order that the senior members might attend the main meeting of the Junior Academy to be held at that time. It was also planned to invite the junior members to attend the section meetings of the Senior Academy. Senior members were to be requested to make a special effort to associate with the junior members and to welcome them to the section meetings.

It was suggested that funds from certain research foundations might be available for scholarships for science teachers; and that meetings of the college science teachers in the State would be interested in such possibilities.

The meeting adjourned at 1:15 P.M.

FOLEY F. SMITH, *Secretary*

AGRICULTURAL SCIENCE SECTION

Dr. Seymour L. Kalison has been appointed Professor in the Extension Service at Virginia Polytechnic Institute. He will serve as Extension Specialist of Livestock Diseases and will organize an educational program related to the control of such diseases.

The Department of Biochemistry and Nutrition at Virginia Polytechnic Institute recently received a grant of $6500 from the National Institutes of Health to study nutritional edema in experimental animals.

The Department of Biochemistry and Nutrition at Virginia Polytechnic Institute, in cooperation with the Department of Biology (Animal Disease Section), perfected a method (Virginia Agricultural Experiment Station Technical Bulletin No. 121, September, 1953) for the detection of highly chlorinated naphthalenes in lubricants, the compounds that produce hyperkeratosis (X-disease) in cattle.

G. Talbot French, Virginia State Entomologist and director of the Division of Plant Industry, State Department of Agriculture, retired January 15 after serving with the Department 42 years. Educated at what is now the University of Massachusetts and at Cornell University, Mr. French has been president of the Association of Official Seed Analysists of North America, the Eastern Plant Board, and the Seed Control Officials of the Northeastern States.

Mr. French is a past chairman of the Section on Plant Pest Control and Quarantine of the American Association of Economic Entomologists, and was a member of the National Plant Board, the American Phytopathological Society; the American Association of Economic Entomologists, the American Association for the Advancement of Science, the Virginia Academy of Science, the Virginia State Horticultural Society and the Virginia Nurseryman's Association.

Succeeding Mr. French as State Entomologist and director of the Division is C. R. Willey, who has been Associate State Entomologist in charge of crop pest control. Mr. Willey received his B.S. degree from Virginia Polytechnic Institute in 1920 and a M.S. from the same institution in 1922. He is a member of the Entomological Society of America and the Eastern Plant Board.

Dr. C. C. Brooks, Ph.D., University of Missouri, will begin his position in Animal Husbandry at Virginia Polytechnic Institute March 1, 1954, doing ¾ time teaching and ¼ time swine research. He is filling the vacancy created by the resignation of Professor D. B. Allen.

Dr. W. E. Chappell, Plant Physiologist, Department of Plant Pathology and Physiology, Virginia Agricultural Experiment Station, Blacksburg, Virginia, received an award for presenting the outstanding paper in the Agronomic Section of the Northern Weed Control Conference, which was held in New York City in January, 1954. His paper was entitled "Chemical Versus Cultural Control of Weeds in Soybeans."

Denver D. Bragg, Associate Extension Poultry Husbandman, Virginia

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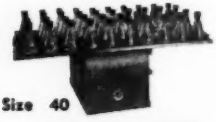

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Polytechnic Institute, accompanied Virginia's 4-H poultry representatives to the Poultry Fact Finding Conference held in Kansas City February 12 to 15. Kermit Spruill, a first year poultry major at Virginia Polytechnic Institute and Gerald Reed Taylor of Accomac County, were selected for this trip because of their outstanding accomplishments with their poultry projects. The contributions of seven Virginia processing firms made this trip possible.

Dr. James H. Bywaters, Research Professor of Poultry Husbandry, Virginia Agricultural Experiment Station, attended the meeting of a Coordinating Committee of the Poultry Section of the Association of Southern Agricultural Workers held on January 30 at Texas Agricultural and Mechanical College, College Station, Texas. The primary purpose of the committee is to bring about closer cooperation between the folks in industry and the educational institutions. The report of this committee was accepted by the parent organization at its meeting in Dallas from February 1 through 3, and the committee was asked to continue to work.

The Virginia 4-H Poultry Judging Team composed of Sterling Mullens and Byron Childress of Dickenson County, Edry Jenkins of Gloucester County, and C. J. Martin of Franklin County, placed first in the Northeastern Interstate 4-H Poultry Judging Contest held at Boston in connection with the Boston Poultry Show, January 22. Virginia also had the two high-scoring individuals. Fred Fletcher, County Agent of Dickenson County, acted as coach and accompanied the team to the contest.

The following bulletins in the field of agriculture and home making have been issued by Virginia Polytechnic Institute:

Extension Bul. 131 — Virginia Spray Bulletin (for orchards).
Extension Bul. 200 — Factors for Successful 4-H Club Work.
Extension Bul. 205 — Farm Weeds, Their Importance and Control.
Extension Bul. 209 — What is Beautiful in Home Furnishings?
Extension Bul. 211 — Family Washing.
Extension Bul. 212 — Fertilizing Virginia Vegetables.
Extension Circ. 386 — Large Yields, Better Quality Tobacco (Rev.).
Extension Circ. 437 — Managing Your Tobacco Plant Beds (Rev.).
Extension Circ. 598 — Your Posture — Your Voice.
Extension Circ. 604 — Control of House Mice.
Extension Circ. 605 — Timely Control of Garden Diseases and Insects.
Exp. Sta. Bul. 461 — Newcastle Disease of Fowls.
Exp. Sta. Bul. 465 — Mouse Control in Virginia Orchards.

Mr. J. O. Nicholson, who has been serving as an Instructor of Horticulture at Virginia Polytechnic Institute, has resigned to accept a position as Assistant County Agent in Coshocton County, Ohio. This appointment is effective March 1, 1954.

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Edward J. Albert, Manager of the Poultry Plant at Virginia Polytechnic Institute since December, 1924, was retired December 20, 1953 because of ill health.—WESLEY P. JUDKINS.

BACTERIOLOGY SECTION

Dr. H. J. Welshimer, Assistant Professor of Bacteriology in the Department of Microbiology at the Medical College of Virginia, has received a grant of $5,049 from the National Institute of Health to support fundamental virus research. Dr. Welshimer's work will be concerned primarily with studies on virus adsorption and immunity of the host cells using the lysogenic bacterium-bacteriophage system as a model.

Dr. Holmes T. Knighton, Professor of Dentistry and Bacteriology in the Department of Microbiology at the Medical College of Virginia, attended the annual meeting of the Council on Dental Therapeutics of the American Dental Association held in Chicago January 22 and 23, where he presented reviews on the value of antibiotic troches in oral infections and an evaluation of alginic acids as hemostatic agents in oral conditions. Dr. Knighton is a member of the Council. — J. DOUGLAS REID.

BIOLOGY SECTION

Mr. Paul M. Patterson has been granted a sabbatical leave from Hollins College for the spring semester 1954. He will collect bryophytes in selected areas of Virginia for a six-months period and study the collections after returning to Hollins. Travel expenses for the project have been made available by the Hollins College Faculty Research Fund and the National Science Foundation.

Dr. Gertrude Miller, who was awarded the doctorate by Cornell University in Botany will take over Mr. Patterson's teaching duties at Hollins while he is on leave.

Ralph Alston, 1949 graduate of William and Mary, is in his third year of graduate work at Indiana University, where he is making a chromotographic study of flower colors in *Impatiens* and investigating the biochemical bases for the inheritance of those colors. The data accumulated on the garden balsam by the late Donald W. Davis are the point of departure for Alstons' work.

Longwood College has been awarded a contract by the Atomic Energy Commission for research on the effects of combined chemical and radiation treatments on cell division and growth in the small seeded grasses. Work will be done at Longwood during the college year and at Oak Ridge during the summer months. Mr. Robert T. Brumfield will direct the research project with Mr. Donald Foard as Assistant. Mr. Foard has completed the requirements for the Masters degree majoring in Cytology at the University of Virginia and will begin work at Longwood March 1, 1954.—ROBERT T. BRUMFIELD.

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ENGINEERING SECTION

Mr. H. E. Mahony, recently manager of the Stonewall plant of Merck and Company in Elkton, Virginia, has been transferred to the Rahway, New Jersey plant as Customer Service Manager in the Marketing Division.

Professor Robert W. Truitt of the Aeronautical Engineering Department of Virginia Polytechnic Institute will serve as Director and Principal Investigator for a research program in transonic flow sponsored by the Air Research and Development Command. Professors R. W. Truitt and F. W. Martin recently attended a conference on transonic wind tunnel testing at Purdue University.

Associate Professor Dudley Thompson of the Chemical Engineering Department of Virginia Polytechnic Institute presented a paper, "The Effect of Ultrasonic Energy on the Settling of Solids in Phosphate Tailings" at a meeting of the Industrial and Engineering Chemistry Division of the American Chemical Society in Ann Arbor, Michigan, December 28 and 29, 1953. Professor Frank C. Vilbrandt was one of the co-authors of this paper.

Professor Nelson F. Murphy of the Chemical Engineering Department of Virginia Polytechnic Institute has been Director and Principal Investigator of a research project on Mass Transfer Studies in Liquid-Liquid Extraction which will be continued under the sponsorship of the Atomic Energy Commission.

Professor Dan H. Pletta of the Department of Applied Mechanics of Virginia Polytechnic Institute has been serving as Secretary of the Committee on Evaluation of Engineering Education of the American Society for Engineering Education. On February 16 to 20, 1954, he attended a meeting of this Committee in Atlanta, Georgia. Professors Dan Pletta and Dan Frederick of the Department of Applied Mechanics presented a paper entitled "Model Anaysis of a Skewed Rigid Frame Bridge and Slab" at the American Concrete Institute Convention in Denver, Colorado in February, 1954. This paper is a report on research connected with the activities of the Committee on Rigid Frame Bridges of that Society. Professor Pletta is Chairman of this Committee and of the Committee on Flat Slabs.

Mr. Bernard Neimeier, formerly associated with Experiment Incorporated in Richmond, Virginia has announced the formation of his own organization under the name Faultless Engineering and Machine Corporation, also located in Richmond.

Mr. Tilton E. Shelburne, Director of the Virginia Council of Highway Investigation and Research at the University of Virginia, was elected President of the Virginia Section of the American Society of Civil Engineers at its annual meeting held in December, 1953. Mr. Shelburne has rcently assumed Chairmanship of the Department of Design of the Highway Research Board, affiliated with the National Academy of Science.

Mr. Alfred Maner, formerly with the Virginia Council of Highway In-

vestigation and Research in Charlottesville, has assumed the position of Assistant Testing Engineer of the Virginia Department of Highways in Richmond.

Mr. Phillip Melville, of the Virginia Council of Highway Investigation and Research in Charlottesville presented a paper at the annual meeting of the Highway Research Board in Washington during January, 1954 entitled, "Further Temperature and Moisture Characteristics of Concrete Curing Methods".

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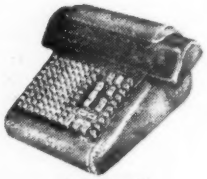

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Professors R. M. Hubbard and O. L. Updike, Jr. of the Department of Chemical Engineering of the University of Virginia attended the annual meeting of the American Chemical Society in St. Louis in December, 1953 and meetings of national committees of this Institute on which they serve.—ROBERT M. HUBBARD.

GEOLOGY SECTION

Robert S. Young, who received his Ph.D. degree in geology from Cornell University on February 1, returned to full-time duty with the State Geological Survey, as stratigrapher-structural geologist on February 16. He will in the near future begin detailed field studies of the geology and nonmetallic resources of the northern half of the Appalachian Ridge and Valley region.

Edwin O. Gooch has recently completed field work on metasedimentary rocks in the Laurel Mills-Batesville district of the central Piedmont region. Upon completion of the report on that district, he will begin a study of magnetite deposits in Carroll County.

Arthur A. Pegau is preparing a summary report on titanium in Virginia for pubication as an Information Circular of the Survey.

A detailed report on the "Geology and Oil Possibilities of the Rose Hill district, L County, Virginia," by Ralph L. Miller and J. O. Fuller, is in press as Bulletin 71 of the Virginia Geological Survey. A similar report on the Geology and Oil Possibilities of the Jonesville district, Lee County, Virginia, by Raph L. Miller and Steve Brosges is being printed as United States Geological Survey Bulletin 990.

An article on "Structural Framework and Mineral Resources of the Virginia Piedmont," by William R. Brown, which is Reprint Series No. 16 of the Survey, is expected to be received soon from the State Printer.

William R. Brown, Edwin O. Gooch, and Arthur A. Pegau will present papers on *Virginia geology* at the meeting of the Southeastern Section of the Geological Society of America to be held at the University of South Carolina, in Columbia, S. C. on April 15, 16 and 17.—W. D. LOWRY.

STATISTICS SECTION

The Southern Regional Graduate Summer Session in Statistics will be held at Virginia Polytechnic Institute, June 9 through July 17, 1954. In addition to the Virginia Polytechnic Institute faculty, Professor Maurice G. Kendall, Professor Bernie G. Greenberg, and Professor Ralph E. Comstock will offer courses in Multivariate Analysis, Quantitative Genetics, and Biostatistics respectively. The following distinguished visiting statisticians will give seminar lectures: Gertrude Cox, M. G. Kendall, Ralph Comstock, W. A. Hendricks, Harold Hotelling, J. R. Stockton, H. H. Chapman, C. A. Bicking, F. J. Anscombe, W. F. Callander, R. C. Bose, B. G. Greenberg, and James W. Johnston, Jr.

A meeting of the Commission on Statistics of the Southern Regional Board of Education will meet at Virginia Polytechnic Institute on June 27, 28, 29, 30, 1954. There will be approximately 100 attending, including the leaders in statistics in the South. A number of distinguished statisticians from throughout the United States have been invited as consultants. The program will consist of discussing the training of undergraduates and graduates in statistics, research, and consulting. Part of the program will be on preparing students for statistical work in industry, and a number of leading industrialists will be called in to see what needs should be met.

The following members of the Virginia Poytechnic Institute Statistics Department will attend the joint meeting of Institute of Mathematical Statistics and Biometrics Society in Gainesville, Florida, March 16, 17, 18, 1954: Boyd Harshbarger, R. A. Bradley, D. B. Duncan, M. C. K. Tweedie, G. L. Edgett, W. A. Thompson, Jr., P. N. Somerville, C. Y. Kramer, and T. S. Russell. Boyd Harshbarger is chairman of the program committee for the Biometrics Society and R. A. Bradley is chairman of the program committee for the Institute of Mathematical Statistics. Boyd Harshbarger and D. B. Duncan will present invited papers and W. A. Thompson, Jr. will present a contributed paper.

"A Modification of the Ailken-Neville Linear Iterative Procedures for Polynomial Interpolation" by M. C. K. Tweedie of the Virginia Polytechnic Institute Statistics Department has been published in *Mathematical Tables and Other Aids to Computation*, Vol. 8, No. 45, January 1954. Reprints of the above may be obtained from the author.

Dr. Boyd Harshbarger was elected Fellow of the American Statistical

Association at the recent annual meeting in Washington, D. C. This honor was conferred for highly meritorious original contributions to statistical theory and methods and outstanding work in the organization of teaching and research in statistics.—W. A. HENDRICKS.

Virginia Academy of Science

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OF THE

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UNIVERSITY OF VIRGINIA

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WEDNESDAY, MAY 5

3:00 P.M. to 8:00 P.M. — Registration for Junior Academy Members, Participants in the Science Talent Search — Main Lobby, Cabell Hall.

3:00 P.M. to 8:00 P.M. — Arranging Exhibits — Cabell Hall Basement.

THURSDAY, MAY 6

8:00 A.M. to 5:00 P.M. — Registration for Junior Academy Members, Senior Academy Members and Guests — Main Lobby, Cabell Hall.

9:00 A.M. — Meeting of Science Exhibit Judges, Science Talent Search Judges — Rooms 428, 451, Cabell Hall.

9:30 A.M. — Meeting of Chairman and Exhibitors, and Science Talent Search Participants — Cabell Hall Auditorium.

10:00 A.M. to 12:30 P. M. and 1:30 to 4:00 P.M. — Finalists of Talent Search meet with Chairman and Interviewers — Cabell Hall, Rooms 428, 451, 254, 255.

10:00 A.M. to 12:30 P. M. and 1:30 to 4:00 P.M. — Judging of Science Exhibit Contests — Cabell Hall Basement.

3:30 P.M. — Meeting of all Senior Academy Section Officers — Room 122, Cobb Chemical Laboratory.

4:00 P.M. — Meeting of the Section Editors — Room 100, Cobb Chemical Laboratory.

5:00 P.M. — Senior Academy Conference and General Meeting — Auditorium, Cabell Hall.

7:30 P.M. — Business Meeting, Junior Academy of Science — Auditorium, Cabell Hall.

8:30 P.M. — Address of Guest Speaker for Junior Academy Members and Guests — Auditorium, Cabell Hall.

9:30 P.M. — Meeting of Virginia Junior Academy of Science Committee — Cabell Hall.

FRIDAY, MAY 7

8:30 A.M. — Registration — Main Lobby, Cabell Hall.

9:00 A.M. — Section Meetings: *Agricultural Sciences* — Room 118, Cabell Hall; *Astronomy, Mathematics, and Physics* — Rouss Physical Laboratory; *Bacteriology* — Room 311, Cabell Hall; *Biology* — Maury Hall; *Chemistry* — Room 200, Cobb Chemical Laboratory; *Education* — Room 122 Cabell Hall; *Engineering* — Room 39, Thornton Hall; *Geology* — Room 244, Cabell Hall; *Medical Sciences* — Amphitheater, Medical School; *Psychology* — Peabody Hall; *Science Teachers* — Room 122, Cobb Chemical Laboratory; *Statistics* — Room 243, Cabell Hall.

10:00 A.M. to 11:30 A.M. — Symposium, "What's New in Physics", sponsored by Science Teachers Section—Room 200, Cobb Chemical Laboratory (see program of Science Teachers Section).

12:00 Noon to 1:00 P.M. — JUNIOR-SENIOR SCIENTIST HOUR *at which Awards will be presented* — Auditorium, Cabell Hall.

2:00 P.M. — Section Meetings.

4:45 P.M. — 6:00 P.M. — The University of Virginia will be host at a tea to the Members and Guests of the Academy—Rotunda.

7:45 P.M. — Short Business Meeting, Senior Academy — Auditorium, Cabell Hall.

8:30 P.M. — Address by Dr. J. A. Becker, Bell Telephone Laboratories, "Seeing and Counting Atoms" with the New Field Emission Microscope" — Auditorium, Cabell Hall.

SATURDAY, MAY 8

9:00 A.M. — Section Meetings.

10:00 A.M. — Academy Council Meeting — Conference Room, Cobb Chemical Laboratory.

Program of
Virginia Junior Academy of Science

WEDNESDAY, MAY 5

3:00 P.M. to 9:00 P.M. — Registration for Junior Academy Members, Participants in the Science Talent Search.

3:00 P.M. to 9:00 P.M. — Arranging Exhibits.

8:30 P.M. to 10:30 P.M. — A Visit to the Observatory.

THURSDAY, MAY 6

8:00 A.M. to 5:00 P.M. — Registration for Juniors.

9:00 A.M. — Meeting of Science Exhibit Judges and Science Talent Search Judges.

9:30 A.M. — Meeting of Chairman, Exhibitors, and Science Talent Search Participants.

10:00 A.M. to 12:00 P.M. — Finalists of Talent Search meet with Chairman and Interviewers.

10:00 A.M.-12:30 P.M. — Judging of Science Exhibits.

1:30 P.M. to 4:00 P.M. — Continuation of Interviews of Finalists.

1:30 P.M. to 4:00 P.M. — Continuation of Judging Exhibits.

7:30 P.M. — Business Meeting of the Junior Academy of Science.

8:30 P.M. — Address of Guest Speaker.

9:30 P.M. — Meeting of Virginia Junior Academy of Science Committee.

FRIDAY, MAY 7

8:30 A.M. — Meeting of 40 Selected Junior Scientists (who will have 40 Senior Scientists as their companions until 12:00 noon).

9:00 A.M. — Section Meetings.

12:00-1:00 P.M. — JUNIOR-SENIOR SCIENTIST HOUR *at which awards will be presented.*

Section of Agricultural Sciences

H. MARSHALL CLARK, *Chairman*
RODNEY C. BERRY, *Vice-Chairman*
R. W. ENGEL, *Secretary*
WESLEY P. JUDKINS, *Section Edtior* (1956)

FRIDAY, MAY 7, 1954 – 9:00 A.M. – ROOM 118, CABELL HALL

9:00 Announcements, Committee appointments, etc.

1. 9:15 The Relationship of Browse to Deer Weights in Bath County, Virginia.
   R. J. Muncy; *Virginia Agricultural Experiment Station.*

2. 9:30 Ecological Succession in Cumberland County, Virginia.
   M. A. Byrd; *Virginia Agricultural Experiment Station.*

3. 9:45 Rabies in Virginia and Its Economic Effect on Agriculture.
   John C. Jones; *Mammal Control Supervisor, Fish and Wildlife Service, Department of Interior.*

4. 10:15 The Production of Bovine Hyperkeratosis (X-disease) with an Experimentally Made Pellet Feed.
   J. S. Copenhaver and W. B. Bell; *Virginia Agricultural Experiment Station.*

5. 10:30 Rumen Inoculation of Beef Calves.
   F. S. McClaugherty and C. M. Kincaid; *Virginia Agricultural Experiment Station.*

6. 10:45 Testing Performance of Beef Cattle on the Farm.
   J. E. Grizzle, C. M. Kincaid, and C. C. Mast; *Virginia Agricultural Experiment Station.*

7. 11:00 Variations in Gestation Periods of Dairy Cattle.
   Paul M. Reaves; *Virginia Agricultural Eperiment Station.*

8. 11:15 Substitution Relationships Between Grain and Forage in Milk Production.
   Carl W. Allen; *Virginia Agricultural Experiment Station.*

9. 11:30 Correlation Between Blood Levels of Carotene and Vitamin E in Dairy Cows in Selected Herds in Virginia.
   W. N. Linkous, N. O. Price, W. B. Bell, W. A. Hardison, and R. W. Engel; *Virginia Agricultural Experiment Station cooperating with the Virginia Artificial Breeder's Association.*

12:00 Noon-1:00 P. M. – Junior-Senior Scientist Hour – Auditorium, Cabell Hall.

FRIDAY, MAY 7, 1954 — 1:30 P.M.

10. 1:30 Problems in the Correlation of Soil Testing with Crop Reponse in Virginia.
Russell K. Stivers and C. I. Rich; *Virginia Agricultural Experiment Station.*

11. 1:45 Trends in Agricultural Chemicals.
Borden S. Chronister; *Nitrogen Division, Allied Chemical and Dye Corporation, Hopewell.*

12. 2:00 Studies of the Parasitism of *Cercospora arachidicola* Hori and *Cercospora personata* (B. and C.) Ell. and Ev.
Lawrence I. Miller; *Virginia Agricultural Experiment Station.*

13. 2:15 Weather Influences on Evaporation.
Joseph M. Johnson; *Virginia Agricultural Experiment Station.*

14. 2:30 Herbicides and Their Importance in Today's Agriculture.
W. E. Chappell; *Virginia Agricultural Experiment Station.*

15. 2:45 The Bromide Content of Peanut Plants from Soil Treated with Ethylene Dibromide for Sting Nematode Control.
R. W. Young, L. I. Miller, and R. W. Engel; *Virginia Agricultural Experiment Station.*

16. 3:00 The Nature of Insect Resistance to Chemical Poisons.
James McD. Grayson; *Virginia Agricultural Experiment Station.*

17. 3:15 An Improved Procedure for the Direct Isolation of Cellulolytic Rumen Bacteria.
Paul H. Smith and K. W. King; *Virginia Polytechnic Institute.*

18. 3:30 Refinements in Plate Counting Procedures for Cellulose Decomposing Soil Microorganisms.
J. D. Castro and K. W. King; *Virginia Polytechnic Institute.*

3:45 Business Meeting.

Section of
Astronomy, Mathematics, and Physics

L. W. WEBB, JR., *Chairman*
H. Y. LOH, *Secretary*
I. G. FOSTER, *Section Editor* (1956)

FRIDAY, MAY 7, 1954 — 10:00 A.M. — ROUSS PHYSICAL LAB.

1. 10:00 Application of the Power Series Transform to Difference Equations in Engineering.
   Leonard McFadden; *Virginia Polytechnic Institute.*

2. 10:15 The Differentiation of Lebesgue Integrals.
   E. J. McShane; *University of Virginia.*

3. 10:30 Methods of Spinning Rotors at Liquid Helium Temperatures.
   Jesse W. Beams; *University of Virginia.*

4. 10:45 The Measurement of Tensile Strength of Metals at Low Temperature.
   John B. Breazeale; *University of Virginia.*

5. 11:00 Adsorption and Surface Energy.
   N. Cabrera; *University of Virginia.*

6. 11:15 Neutron Interactions in Organic Scintillators.
   Roger W. Clapp and Robert T. Wagner; *University of Virginia.*

7. 11:30 Measurement of Molecular Weights by the Equilibrium Method.
   H. M. Dixon; *University of Virginia.*

8. 11:45 The Effect of a Centrifugal Field on Diffusion in Metals.
   Orville R. Harris; *University of Virginia.*

12:00 Noon-1:00 P.M. — Junior-Senior Scientist Hour — Auditorium, Cabell Hall.

FRIDAY, MAY 7, 1954 — 2:00 P.M.

2:00 Business Meeting.

9. 2:15 Positron Annihilation in Liquid Helium.
   Frank L. Hereford; *University of Virginia.*

10. 2:30 The Magnetic Microbalance.
    Charles W. Hulburt; *University of Virginia.*

11. 2:45 Lattice Summations in Crystals and Energy of Twin Boundaries.
    M. Levine; *University of Virginia.*

12. 3:00 Dispersion of Thin Lamina.
    H. Y. Loh; *Virginia Polytechnic Institute.*

13. 3:15 Angular Distribution of Photoelectrons Produced by Polarized Gamma-rays.
    William M. McMaster and Frank L. Hereford; *University of Virginia.*

14. 3:30 An Inexpensive Device for Measuring X-Ray Powder Diffraction Patterns.
    W. Richardson; *Virginia Polytechnic Institute.*

15. 3:45 An X-Ray Diffraction Machine Assembled Almost Entirely from War Surplus Parts.
James Scott, R. K. Brown, and W. Richardson; *Virginia Polytechnic Institute.*

16. 4:00 Mechanical Strength of Thin Films of Metals.
Edward F. Turner; *University of Virginia.*

17. 4:15 Commentary on Locating and Constructing the Image of a Virtual Object.
H. D. Ussery, *Virginia Polytechnic Institute.*

18. 4:30 The Measurement of Gyro-magnetic Ratios by a New Method.
Glen S. Waterman; *University of Virginia.*

SATURDAY, MAY 8, 1954 — 9:00 A.M.

19. 9:00 Visual Orbit of Mu Orionis.
Harold L. Alden; *University of Virginia.*

20. 9:15 Photometry of Red Dwarfs.
George S. Mumford, III; *University of Virginia.* (Introduced by A. N. Vyssotsky.)

21. 9:30 The Unusual Variable Star EZ Aquilae.
Charles P. Olivier; *Flower and Cook Observatories, University of Pennsylvania.*

22. 9:45 Astrometric Orbit and Mass Ratio of Mu Orionis.
V. Osvalds; *Leander McCormick Observatory.* (Introduced by H. L. Alden.)

23. 10:00 A Bibliography of Spirals.
Georgie T. Davis and D. S. Davis; *Virginia Polytechnic Institute.*

24. 10:15 Some Relationships Concerning Neo-Pythagorean Triangles.
Herta Taussig Freitag, *Hollins College,* and Arthur H. Freitag, *Jefferson Senior High Schoo, Roanoke.*

25. 10:30 A Brief Method for Transforming Recurring Decimal-Fractions to Mixed Numbers.
Herta Taussig Freitag, *Hollins College,* and Arthur H. Freitag, *Jefferson Senior High School, Roanoke.*

26. 10:45 Ionization in Flames.
I. R. King and H. F. Calcote; *Experiment Incorpated, Richmond.*

27. 11:00 A Set of Lecture Demonstrations.
L. G. Hoxton; *University of Virginia.*

Section of Bacteriology

P. ARNE HANSEN, *Chairman*
H. J. WELSHIMER, *Vice-chairman*
WILLIAM F. LAWRENCE, *Secretary*
J. DOUGLAS REID, *Section Editor*

SATURDAY, MAY 8, 1954 – 11:00 A.M. – ROOM 311, CABELL HALL

11:00 Business Meeting.

SATURDAY, MAY 8, 1954 – 1:30 P.M.

1. 1:30 Studies on the Metabolism of Propionic Bacteria.
   Wesley A. Volk; *University of Virginia.*

2. 1:45 Comparative Bactericidal Effects of Moist and Dry Heat on Certain Nonsporogenous Bacteria.
   H. K. Knighton; *Medical College of Virginia.*

3. 2:00 An Example of Multisporogenous Bacterium.
   H. J. Welshimer; *Medical Colege of Virginia.*

4. 2:15 Respiration of *Mycobacterium paratuberculosis.*
   Robert H. Miller and P. Arne Hansen; *Department of Bacteriology and the Live Stock Sanitary Service Laboratory, University of Maryland.*

5. 2:30 The Tuberculostatic Properties of Ascorbic Acid.
   Quentin N. Myrvik; *University of Virginia.*

6. 2:45 Some Environmental Factors in the Cultivation of *Endamoeba histolytica.*
   E. Clifford Nelson and Muriel Jones; *Medical College of Virginia.*

7. 3:00 Electrophoretic Behavior of *Salmonella pullorum.*
   Shelley Harrell and P. Arne Hansen; *Department of Bacteriology and the Live Stock Sanitary Service Laboratory, University of Maryland.*

8. 3:15 Viral Hepatitis in Mice.
   Michael Potter; *University of Virginia.*

9. 3:30 Some Experiments with the Molecular Filter Membrane Technique and Demonstrations of the Apparatus.
   R. Travis Hill; *Virginia State Department of Health.*

10. 3:45 Development, Use, and Effectiveness of BCG Vaccine.
    William F. Wagner; *Virginia State Department of Health.*

Section of Biology

ZOE WELLS CARROLL BLACK, *Chairman*
VERA B. REMSBURG, *Vice-Chairman*
KENNETH P. STEVENS, *Secretary*
ROBERT T. BRUMFIELD, *Section Editor* (1957)

FRIDAY, MAY 7, 1954 — 9:00 A.M. — MAURY HALL

9:00 Announcement, Committee Reports.

1. 9:10 Notes on the Nutrition of Three Species of *Arcella*.
   John E. Davis, Jr.; *University of Virginia*

2. 9:20 Morphological Observations on Cambarincola Sp. (Annelida, Oligochaeta).
   Benjamin Irving Johns; *University of Virginia.*

3. 9:30 Stain Technique and Observations from a Preliminary Study of Megagametogenesis in *Ilex opaca*.
   John M. Herr, Jr.; *Washington and Lee University.*

4. 9:45 The X-bivalent of the Golden Hamster
   Charles I. Sheaffer; *University of Virginia.*

5. 9:55 Comparison of Certain Developmental Features of the Fiber-follicles of Sheep and Goats.
   Lubow A. Margolena; *U. S. Department of Agriculture.*

6. 10:05 Chromosomes of Representatives of Alismataceae in Gray's Manual Range.
   J. T. Baldwin, Jr. and Bernice M. Speese; *College of William and Mary.*

7. 10:15 A Study of Normal and Aberrant Meiosis in Oocytes of the Newt, *Triturus viridescens.*
   Asa A. Humphries, Jr.; *University of Virginia Medical School.* (To be introduced)

8. 10:30 Ecology of the Red Cedar, *Juniperus virginiana.*
   A. B. Massey; *Virginia Polytechnic Institute.*

9. 10:40 Notes on the Evolution of the Longulus Group of the Crayfish Genus *Cambarus.*
   Horton H. Hobbs, Jr.; *University of Virginia.*

10. 10:50 Sulfur Nutrition and the Amino Acid Composition of Fur in Relation to the Fur-chewing Syndrome in Domestic Chinchillas.
   C. O. Watlington, J. P. Baker, and K. W. King; *Virginia Polytechnic Institute* (Presented by C. O. Watlington)

11:00 Business Meeting.

12:00 Noon-1:00 P.M. — Junior-Senior Scientist Hour — Auditorium, Cabell Hall.

FRIDAY, MAY 7 — 1:30 P.M.

11. 1:30 Physiology of Diapause in the Grasshopper Embryo, Studied by a New Method of *in Vitro* Culture for Insect Embryos.
Donald H. Bucklin; *College of William and Mary.*

12. 1:40 The Sodium and Potassium Ion Change in the Blood of Hibernating Hamsters.
Lucy Byrd Pegau; *University of Virginia.*

13. 1:50 Studies of Oxygen Capacity in Relation to Sex.
Jack D. Burke; *University of Richmond.*

14. 2:00 An Investigation to Establish the Viability Expectancy of Bulblets of Wild Onion and Garlic *Allium SPP.* Occurring in Field Crop Seed, Based on Size and Physiological Classifications.
C. M. Bass; *Virginia Department of Agriculture.*

15. 2:10 Observations on the Circulation of the Kidney of *Rana catesbeiana.*
E. W. Pullen and H. H. Hobbs; *University of Virginia.* (Presented by E. W. Pullen.)

16. 2:20 Temperature and Moisture in the Ecology of Earthworms.
William C. Grant, Jr.; *College of William and Mary.*

17. 2:30 Genetics of Chlordane Resistance in the German Cockroach. Progress Report.
F. E. Jarvis, Jr., J. M. Grayson, and M. Levitan; *Virginia Polytechnic Institute.* (Presented by F. E. Jarvis.)

18. 2:40 Observation on the Mayfly Fauna in an Upper Piedmont Stream in Central Virginia.
Jean E. Pugh; *University of Virginia.*

19. 2:50 A Polarographic Study of Respiration in a Blue-Green Alga.
S. L. Coke, Jr.; *University of Richmond.*

20. 3:00 Morphogenetic Studies on the Subterranean Axes of *Psilotum nudum.*
David W. Bierhorst; *University of Virginia.*

21. 3:10 Abnormal Ovule Development in *Ilex opaca.*
John M. Herr, Jr.; *Washington and Lee University.*

22. 3:20 Observations on the Effects of Some Supposedly Toxic Substances on Ephemeropteran Nymphs.
James L. Larimer; *University of Virginia.*

Chemistry Section

ROBERT C. KRUG, *Chairman*
J. STANTON PIERCE, *Secretary*
CARL J. LIKES, *Section Editor* (1957)

FRIDAY, MAY 7 — 9:00 A.M.—ROOM 200—COBB CHEMICAL LAB.

9:00 Introductory Remarks of the Chairman.

1. 9:05 Studies on the Mechanism of High Temperature Antioxidants.
James W. Cole, Jr., Lewis G. Cochran, Gordon P. Brown, and Miron F. Johnson, Jr.; *University of Virginia.*

2. 9:20 The Oxidation of a Single Crystal of Iron.
Bruce Wagner, Jr.; *University of Virginia.*

3. 9:40 The Structure of Oxide Films on Copper Single Crystals.
Kenneth R. Lawless; *University of Virginia.*

4. 9:55 The Effect of Contaminants on the Oxidation of Copper Single Crystals.
Kenneth R. Lawless; *University of Virginia.*

5. 10:10 The Influence of Foreign Atoms on the Catalytic Properties and Surface Structure of Metal Single Crystals.
Robert E. Cunningham; *University of Virginia.*

6. 10:35 Studies of the Chemical Properties of Single Crystals of Silver Chloride.
Frances H. Cook; *Virginia Institute for Scientific Research.*

7. 10:50 Applications of the Field Emission Microscope.
Peter B. Sherry; *University of Virginia.*

8. 11:05 The Adsorption of Organic Poisons on the Hydrogen Electrode.
Thomas C. Franklin and Phillip Oglesby; *University of Richmond.*

9. 11:15 An Industrial Chemist Looks at Farming (Guest Lecture).
Robert H. Kean; *Virginia-Carolina Chemical Corp.*

12:00 Noon-1:00 P.M. — Junior-Senior Scientist Hour — Auditorium, Cabell Hall.

FRIDAY, MAY 7 — 1:45 P.M.

10. 1:45 Effect of Solute Concentration on Surface and Interfacial Tensions of Several Liquid Systems.
John E. Lastovica and Nelson F. Murphy; *Virginia Polytechnic Institute.*

11. 2:00 Ultraviolet Absorption of Chalcones.
W. Bruce Black and Robert E. Lutz; *University of Virginia.*

12. 2:15 Ring-Chain Relationships in the 2-(N-Acetal-N-benzylamino)−1,2-diphenylethanone and Ethanol Series. The Mechanism of Cyclo-trans-Etherification.
Claibourne E. Griffin and Robert E. Lutz; *University of Virginia.*

13. 2:30 The Preparation of Dialkyl Zinc Compounds.
Robert C. Krug and Philip J. C. Tang; *Virginia Polytechnic Institute.*

14. 2:40 Structural Effects in the Kinetics of Schiff Base Formation.
Richard L. Hill and Thomas I. Crowell; *University of Virginia.*

2:55 Announcement of Talent Search Winners in Chemistry.

15. 3:00 A Study of the Reaction Between o-Chlorobenzyl Chloride and Naphthalene.
Frank A. Vingiello and Alexej Borkovec; *Virginia Polytechnic Institute.*

16. 3:10 B-Tetrahydro- and Decahydroquinolinylethanol as Intermediates.
Charles J. Hansrote, Jr., Y. H. Chen, and J. Stanton Pierce; *University of Richmond.*

17. 3:20 Some Consideration of the Occurrence and Structure of Phosphate Minerals.
D. S. Sears; *Virginia-Carolina Chemical Corp.*

18. 3:35 Studies on *O, O, O-Trialkyl Phosphorothioates.*
C. L. Harowitz, C. E. Setliff, and J. R. Mangham; *Virginia-Carolina Chemical Corp.*

19. 3:45 The Preparation of Some Alkylphosphoric Amides.
J. R. Mangham and T. M. Melton; *Virginia-Carolina Chemical Corp.*

20. 4:00 The Fungitoxicity of Nicotine and Nicotine Derivatives.
Lewis E. Govette; *Virginia-Carolina Chemical Corp.*

21. 4:15 A Laboratory Method for the Evaluation of Organic Phosphorus Compounds for Insecticidal Activity.
M. A. Manzelli and V. H. Young; *Virginia-Carolina Chemical Corp.*

4:30 Adjourn.

SATURDAY, MAY 8 – 9:00 A.M.

22. 9:00 Molecular Dimensions of Zein.
Carl J. Likes; *Virginia Institute for Scientific Research.*

23. 9:10 Anisotropic Swelling of Zein Fibers.
George L. Walker, Jr. and J. Samuel Gillespie, Jr.; *Virginia-Carolina Chemical Corp.*

24. 9:20 Correlation of Molecular Weight-Distribution Data for High Polymers.
D. W. Levi and D. S. Davis; *Virginia Polytechnic Institute.*

25. 9:30 Chemistry of Clorene.
Albert W. Lutz; *College of William and Mary.*

26. 9:40 Reduction Products of Aromatic Nitro Compounds Using Silicon-Sodium Hydroxide.
Ira A. Updike and Edward C. Wilson; *Randolph-Macon College.*

27. 9:50 The Effect of the Medium on the Thiosulfate-Ethyl Bromide Reaction.
Francis B. Clough, Thomas S. Russell, and J. C. Salonish; *Virginia Polytechnic Institute.*

28. 10:05 Some Modern Aspects of Urinary Calculi in Relation to Dissolution by Enzymes.
Lawrence W. Claffey, David Levi, and S. Ford; *Virginia Polytechnic Institute.*

29. 10:15 A New Reagent for the Colorimetric Determination of Traces of Magnesium.
Charles K. Mann and John H. Yoe; *University of Virginia.*

30. 10:30 Colorimetric Determination of Boron with Tetrabromochrysazin.
Robert L. Grob and John H. Yoe; *University of Virginia.*

31. 10:45 Potentiometric Microdetermination of Halogen in Organic Compounds.
Everett C. Cogbill and J. Jack Kirkland; *University of Virginia.*

32. 11:00 A Study of Spectrophotometric Methods for the Determination of Trace Quantities of Boron.
James E. Hardcastle, Emmett H. Poindexter and W. Allan Powell; *University of Richmond.*

33. 11:10 Influence of the Cyclopropyl Group on the Stability of Copper Chelates of 1,3-Dicarbonyl Compounds.
Barbara Ann Braun and Helen L. Whidden; *Randolph-Macon Woman's College.*

34. 11:25 A Progress Report on the Study of Coordination Compounds of Polyhydroxyamines.
William E. Trout, Jr., J. Stanton Pierce and Jane Bell Gladding; *University of Richmond.*

35. 11:35 Factors Influencing Chelate Formation.
Maxwell L. Cluett; *University of Virginia.*

36. 11:50 Electrical Conductivity of Some Molten Salts.
O. L. Updike, Jr. and L. B. Johnson, Jr.; *University of Virginia.*

12:00 Adjourn.

Section of Engineering

ROBERT W. TRUITT, *Chairman*
PHILLIP L. MELVILLE, *Secretary*
ROBERT M. HUBBARD, *Section Editor* (1958)

FRIDAY, MAY 7, 1954 — 9:00 A.M. — ROOM 39, THORNTON HALL

9:00 Announcements.

1. 9:15 Road Roughness Measurements on Virginia Pavements.
Thomas H. Forrer; *Virginia Council of Highway Investigation and Research.*

2. 9:30 An Automatic Tuning Band Pass Filter.
Harry L. Beazell; *University of Virginia.*

3. 9:45 Organization of Mechanical Designs.
B. A. Niemeier; *Faultless Engineering and Machine Corporation, Richmond, Va.*

4. 10:00 Pressure Distribution on Two Dimensional Bodies in a Non Uniform Free Stream.
Joseph Hendricks; *Virginia Polytechnic Institute.*

5. 10:15 P-V-T Relationships for Trichloromonofluoromethane.
Robert L. Brehm and D. S. Davis; *Virginia Polytechnic Institute.*

6. 10:30 Transient Responses of Non Linear Systems.
A. F. Lampros; *Virginia Polytechnic Institute.*

7. 10:45 Investigation of Pressure Distribution on a 180° Wedge.
R. W. Truitt and J. C. Williams III; *Virginia Polytechnic Institute.*

8. 11:00 Skid Tests for Safety.
A. W. Maner; *Virginia Department of Highways.*

9. 11:15 Some Problems of Elastic Beams Resting on a Foundation Including Effect of Shear and Normal Pressure.
D. Frederick and F. Blottner; *Virginia Polytechnic Institute.*

10. 11:30 Model Studies of Pile Foundations Subject to Lateral Loading.
R. K. L. Wen; *Virginia Council of Highway Investigation and Research.*

11. 11:45 Guided Missile Airframe Responses.
C. D. West; *McDonnell Aircraft Co., St. Louis, Mo.*

12:00 Noon-1:00 P.M. — Junior-Senior Scientist Hour — Auditorium, Cabell Hall.

12. 2:00 Reveries of An Engineer.
W. R. Glidden; *Virginia Department of Highways.*

13. 2:30 Structural Applications of Aluminum Alloys.
Charles Gaylord; *University of Virginia.*

14. 2:45 Some Fundamental Theorems on Similar and Dissimilar Elastic Models.
D. Frederick; *Virginia Polytechnic Institute.*

15. 3:00 Thermal Anisotropy and Conductivity of Nylon 66.
Arthur C. Doumas and Robert A. Fisher; *Virginia Polytechnic Institute.*

16. 3:15 The Construction of Influence Lines with a Mechanical Interferometer.
James H. Sword; *Virginia Polytechnic Institute.*

17. 3:30 Flow Visualization by Schlieren Techniques for Mixing Studies.
Barbour B. Wilson and O. L. Updike, Jr.; *University of Virginia.*

18. 3:45 An Investigation of Furnace Wall Heat Losses.
F. Anthony Iachetta; *University of Virginia.*

4:00 Business Meeting.

SATURDAY, MAY 8, 1954 — 9:00 A.M.

19. 9:00 An Instrument for Recording the Earth's Electric Field.
Robert F. Fleming, Jr.; *University of Virginia.*

20. 9:15 Extraction and Evaluation of Tobacco Seed Oil.
Robert A. Fisher; *Virginia Polytechnic Institute.*

21. 9:30 Effects of Ultrasonic Insonation on Solvent Extraction of Oil from Peanuts.
Dudley Thompson and D. G. Sutherland; *Virginia Polytechnic Institute.*

22. 9:45 Pressure Distribution About Diamond Airfoils in a Two Dimensional Incompressible Flow.
F. W. Martin; *Virginia Polytechnic Institute.*

23. 10:00 Principal Stress Gradients in Gear Teeth.
E. D. Harrison; *Virginia Polytechnic Institute.*

24. 10:15 Countercurrent Flow of Two Phase Liquid-Liquid Systems.
Nelson F. Murphy and John E. Lastovica, Jr.; *Virginia Polytechnic Institute.*

25. 10:30 Effect of 400 Kilocycle Insonation on the Extraction of Aceton from Carbon Tetrachloride with Water.
Dudley Thompson and L. P. Murray, Jr.; *Virginia Polytechnic Institute.*

26. 10:45 Low Cost Study of Supersonic Flow.
D. P. Lalor, James May, and E. C. McClintock; *University of Virginia.*

27. 11:00 Effect of Seed Structure on the Solvent Extraction of Oil from Tobacco Seed.
Jesse M. Carr, Jr. and Robert A. Fisher; *Virginia Polytechnic Institute.*

Section of Geology

WAYNE E. MOORE, *Chairman*
WILLIAM T. HARNSBERGER, *Vice-Chairman*
MARCELLUS H. STOW, *Secretary*
W. D. LOWRY, *Section Editor* (1958)

FRIDAY, MAY 7, 1954 — 9:00 A.M. — ROOM 303, BROOKS MUSEUM

1. 9:00 Some Current Projects of the Virginia Geological Survey.
William M. McGill; *Virginia Geological Survey.*

2. 9:10 Infolded Metasediments Near the Axial Zone of the Catoctin Mountain — Blue Ridge Anticlinorium.
Edwin O. Gooch; *Virginia Geological Survey.* (Introduced by William M. McGill.)

3. 9:25 Occurrence of Red Limestone in the Ordovician, Augusta County, Virginia.
R. S. Edmundson; *University of Virginia.*

4. 9:35 Arthrophycus as a Guide Fossil in Northern Virginia.
Robert S. Young; *Virginia Geological Survey.* (Introduced by William M. McGill.)

5. 9:45 Geological Section Along Roanoke River from Clarksville, Virginia to Roanoke Rapids, North Carolina.
Wilbur A. Nelson; *University of Virginia.*

6. 9:55 Display of Scintillometer, Geiger Counters, and Ultraviolet Lamps.
Marcellus H. Stow; *Washington and Lee University.*

7. 10:00 Geology of Uranium Deposits with Special Reference to the Geology of Virginia.
Donald L. Everhart; *Chief, Geological Branch, Raw Materials Division, U. S. Atomic Energy Commission.* (Introduced by Marcellus H. Stow.)

8. 10:25 The Master's Degree in Geology.
Joseph K. Roberts; *University of Virginia.*

9. 10:35 Studies of Stream Profiles in the Shenandoah Valley, Virginia.
John T. Hack; *U. S. Geological Survey.* (Introduced by Marcellus H. Stow.)

10. 10:50 Soil Mineralogical Studies in the Middle River Basin, Virginia.
Dorothy Carroll; *U. S. Geological Survey.* (Introduced by Marcellus H. Stow.)

11. 11:05 Investigations of Alluvial Clays in the Shenandoah Valley, Virginia.
John C. Hathaway; *U. S. Geological Survey.* (Introduced by Marcellus H. Stow.)

11:20 Announcements.

12:00 Noon-1:00 P.M. — Junior-Senior Scientist Hour — Auditorium, Cabell Hall.

FRIDAY, MAY 7, 1954 — 2:00 P.M.

12. 2:00 Clay Minerals in Tatum Silt Loam Soil.
C. I. Rich; *Virginia Agricultural Experiment Station.*

13. 2:15 Subsurface Drainage Along North Side of Walker Mountain, Virginia.
Jean Lowry; *Virginia Geological Survey.*

2:20-3:05 Symposium on Dolomites.

14. 2:20 Fundamental Aspects of Genesis of Appalachian Dolomites.
B. N. Cooper; *Virginia Polytechnic Institute.*

15. 2:30 Staining Methods for Differentiating Limestones and Dolomites.
C. R. B. Hobbs, Jr.; *Virginia Polytechnic Institute.* (Introduced by B. N. Cooper.)

16. 2:40 Selective Obliteration of Fossils by Dolomitization.
W. E. Moore; *Virginia Polytechnic Institute.*

17. 2:45 Pre-lithification Features of Some Appalachian Dolomites.
W. D. Lowry; *Virginia Polytechnic Institute.*

18. 2:55 Possible Trace-element and Isotope Control of Dolomite Formation.
R. V. Dietrich; *Virginia Polytechnic Institute.*

19. 3:05 Deposition of Calcite and Aragonite in Caves.
J. W. Murray; *Virginia Polytechnic Institute.* (Introduced by Wayne E. Moore.)

20. 3:20 Geology of Austinville District, Wythe County, Virginia.
W. Horatio Brown; *New Jersey Zinc Company.*

21. 3:35 Magnetic and Electrical Resistivity Survey of the Bush-Hutchins Ilmenite Prospect, Vinton, Virginia.
Charles E. Sears, Jr.; *Virginia Polytechnic Institute.*

22. 3:50 A Review of Recent Literature on the Geology and Origin of Pegmatites.
Arthur A. Pegau; *Virginia Geological Survey.*

23. 4:00 Exploratory Driling on the Eastern Shore Peninsula, Virginia.
G. Chase Tibbitts, Jr.; *U. S. Geological Survey.* (Introduced by Allen Sinnott.)

24. 4:05 Heavy Minerals of Some Yorktown (Miocene) Sediments of Virginia.
Joseph S. Laurent, David W. McCain, Albert J. Perry; *Washington and Lee University.* (Presented by Albert J. Perry.)

25. 4:15 Mineral Studies of the Product of Some Virginia Quarries.
Bertram S. Griffith, Jr., Eugene B. Sieminski, Mahlon D. Woodring; *Washington and Lee University.* (Presented by Eugene B. Sieminski.)

26. 4:25 Note on the Four Types of Crustal Megashearing in Virginia.
B. Ashton Keith; *The Institute of Sciences.*

4:40 Business Meeting.

SATURDAY, MAY 8, 1954 — 8:00 A.M.

8:00 Field Trip to Triassic Areas.
Leader: Joseph K. Roberts. (Place of assembling and details of trip to be announced during Friday meeting.)

Section of Medical Sciences

D. R. H. COURLEY, *Chairman*
SIDNEY SOLOMON, *Secretary*
EBBE C. HOFF, *Section Editor* (1954)

FRIDAY, MAY 7, 1954 — 9:30 A.M. — MEDICAL SCHOOL AUDITORIUM

1. 9:30 Motion Pictures Showing Nerve Growth and Other Cell Activities in Tissue Culture of Retina and Brain from Frog and Rat.
   Carl C. Speidel; *University of Virginia Medical School.*
2. 9:45 The Presence of Argentophilic Cells in the Human Adenohypophysis.
   William M. Shanklin; *Medical College of Virginia.*
3. 10:00 Effects of Hormones on Serum Protein Patterns.
   Cornelia Hoch-Ligeti and Karen Irvine; *University of Virginia Medical School.*
4. 10:15 Chemical and Ultracentrifugal Lipid Analysis of Diabetic and Cardiac Sera.
   D. F. Koenig, P. D. Camp, W. R. Jordan, J. C. Forbes, and C. J. Likes; *Virginia Institute for Scientific Research.*
5. 10:30 The Role of Adrenal Glands in the Support of Arterial Blood Pressure in Dogs and Cats Following Extensive Surgery.
   E. D. Brand; *University of Virginia Medical School.*
6. 10:45 A Theory of Thyroxine Action.
   Chalmers L. Gemmill; *University of Virginia Medical School.*
7. 11:00 Effect of Alcohol and ACTH on Liver Ascorbic Acid in the Guinea Pig.
   J. C. Forbes and G. M. Duncan; *Medical College of Virginia and The Division of Alcoholic Studies and Rehabilitation, Dept. of Health, State of Virginia.*
8. 11:15 Blood and Urinary Changes During Acute Alcohol Intoxication in Dogs.
   Cerda I. Klingman, Ruby Bane, Harry Bachman, and Harvey Haag; *Medical College of Virginia.*

11:30 Business Meeting.

12:00 Noon-1:00 P.M. — Junior-Senior Scientist Hour — Auditorium, Cabell Hall.

FRIDAY, MAY 7, 1954 – 1:30 P.M.

9. 1:30 Sedative Hypnotic Properties of 2-ethyl-crotonyl urea.
Merle H. Pindell, Otis E. Fancher, and Robert K. S. Lim; *Miles-Ames Research Laboratory.*

10. 1:45 Sacro-Coccygeal Tumor.
J. E. Kindred; *University of Virginia Medical School.*

11. 2:00 The Use of a Persistent Screen Oscilloscope for the Accurate Measurement of Seizure Threshold in Rats.
Cary G. Suter, Guy C. Heye, Jr., and Thomas H. Simmons, Jr.; *University of Virginia Hospital.*

12. 2:15 Studies on Pancreatic Trans-membrane Potentials.
S. Solomon; *Medical College of Virginia.*

13. 2:30 Effects of Adenosine Triphosphate, Magnesium, and Calcium on the Phosphate Uptake by Rabbit Erythrocytes.
H. Jonas; *University of Virginia Medical School.*

14. 2:45 Potassium Adsorption by Epithelial Cells of Isolated Frog Skin.
E. G. Huf and J. P. Wills; *Medical College of Virginia.*

15. 3:00 Inhibition of *In Vitro* Heme Synthesis from N^{15} Glycine by 2, 5-Dimethylbenzimidazol, 5, 6 Dimethylbenzimidazol, and Related Compounds.
Lynn D. Abbot, Jr. and Mary J. Dodson; *Medical College of Virginia.*

16. 3:15 *In Vitro* Measurement of Potassium Turnover in Rat Skeletal Muscle.
D. R. H. Gourley; *University of Virginia Medical School.*

17. 3:30 Studies on the Metachromatic Reaction of Heparin-like Substances.
John Kelly; *Medical College of Virginia.*

18. 3:45 A Simple Method for the Determination of Azo Dyes in Tissues.
C. C. Clayton; *Medical College of Virginia.*

19. 4:00 Influence of Cortisone on the Mortality of X-Irradiated Adrenalectomized Mice.
George A. Santisteban; *Medical College of Virginia.*

20. 4:15 Bovine Leptospiral Meningitis and Uveitis.
Warren G. Hoag and Wilson P. Bell; *Virginia Agricultural Experiment Station.*

Section of Psychology

STANLEY B. WILLIAMS, *Chairman*
HANNAH S. DAVIS, *Secretary-Treasurer*
REUBEN S. HORLICK, *Executive Committeeman*
RICHARD H. HENNEMAN, *Section Editor*

FRIDAY, MAY 7, 1954

CLINICAL SECTION — 9:00 A.M. — ROOM 1, PEABODY HALL

1. 9:00 An Alternate Form of the Shipley-Hartford Abstraction Scale.
   Reuben S. Horlick; *Walter Reed Army Hospital, Washington, D. C.*
2. 9:20 Abstract and Concrete Thinking in Schizophrenia: A Vocabulary Study.
   A. W. Jeffreys; Jr.; *Richmond Professional Institute.*
3. 9:40 An Investigation of Revised Beta Scores (Lindner-Gurvitz Scale) Among Negro Adolescents.
   Walter A. Woods, Jack H. Boger, and Georgiana Holman; *Richmond Professional Institute.*
4. 10:00 House-Tree-Person Research on Children.
   Richmond Professional Institute
   a. Theory and Method in H-T-P Research.
      Vytautas J. Bieliauskas.
   b. Developmental Patterns in House Drawings.
      Walter A. Woods and Lawrence Repucci.
   c. Developmental Patterns in Tree Drawings.
      Frank X. Duffy.
   d. Developmental Patterns in Person Drawings.
      Vytautas J. Bieliauskas and L. W. Pennington.
   e. Visual Perception and Developmental Patterns in H-T-P.
      Walter A. Woods.
5. 10:40 The Influence of Emotional Neglect on the Test Scores of Infants.
   Catherine T. Giblette; *Memorial Guidance Clinic, Richmond.*
6. 11:00 Diffusion Theory and Its Application to Social Research.
   Henry Winthrop; *Richmond Professional Institute.*

7. 11:20 Preliminary Evaluation of Rorschach Characteristics of Some Alcoholic Patients.
John Mendenhall; *Lynchburg State Colony.*

8. 11:40 Identification and Guidance of the Gifted at Early Ages in the Public Schools — Discussion of the Problem and Outline of a Plan.
Antonia Bell Morgan; *Aptitude Associates, Merrifield.*

12:00 Noon-1:00 P.M. — Junior-Senior Scientist Hour — Auditorium, Cabell Hall.

EXPERIMENTAL SECTION — 9:00 A.M.—ROOM 15, PEABODY HALL

1. 9:00 Visual Differentiation after Non-reinforced Training in Differentiated Alleyways.
Melvin Freitag; *University of Virginia.*

2. 9:20 An Experimental Evaluation of the General Drive Concept.
James G. Holland; *University of Virginia.*

3. 9:40 Conflict-produced Changes in the Behavior Patterns of Rats.
William A. Lee; *University of Virginia.*

4. 10:00 Cutaneous Communication Systems Utilizing Mechanical Vibration.
Paul Spector; *University of Virginia.*

5. 10:20 Visual Contribution to Speech Intelligibility in Noise.
William H. Sumby; *University of Virginia.*

6. 10:40 Duration of Success Background and the Effect of Failure upon Performance.
James A. Bayton; *Howard University.*

7. 11:00 The Effect of Variable Amount of Reinforcement upon the Rate of an Operant Response.
Kenneth Hageman; *College of William and Mary.*

8. 11:20 The Effect of Knowledge of Results (Reinforcement) on the Accuracy of a Pure Guessing Response.
Burton R. Wolin and Althea M. Iliff; *College of William and Mary.*

9. 11:40 The Effect of Differing Quality of Reinforcement upon the Level of Performance.
William Wagman; *College of William and Mary.*

12:00 Noon-1:00 P.M. — Junior-Senior Scientist Hour — Auditorium, Cabell Hall.

FRIDAY, MAY 7, 1954 — 2:00 P.M. — ROOM 106, PEABODY HALL

2:00 Business Meeting of Psychology Section.

3:00 Symposium: What Kind of Research Studies Do Clinical Psychologists Need.
Chairman William M. Hinton; *Washington and Lee University.*

Section of Science Teachers

CAROLINE GAMBRILL, *Chairman*
C. L. THOMASSON, *Chairman-Elect*
MARTHA W. DUKE, *Secretary*
L. W. JARMAN, *Section Editor* (1954)

FRIDAY, MAY 7, 1954 — 9:30 A.M. — ROOM 122, COBB CHEMICAL LABORATORY

9:30- 9:40 Appointment of Committees.

1. 9:40-10:00 The Science Teacher's Responsibility in Civil Defense.
Thomas E. Gilmer, *Hampden-Sydney.*

FRIDAY, MAY 7, 1954 — 10:00 A.M. — ROOM 200, COBB CHEMICAL LABORATORY

2. 10:00-10:30 Atomic Energy.
Edward C. Stevenson, *University of Virginia.*

3. 10:30-11:00 What's New in Crystals.
Nicolas Cabrera, *University of Virginia.*

4. 11:00-11:30 What's New in Nuclear Physics.
Frank L. Hereford, *University of Virginia.*

5. 11:30-11:50 Report of Nominating Committee.
Election of Officers.

11:50 Adjournment.

12:00 Noon-1:00 P.M. — Junior-Senior Scientist Hour — Auditorium, Cabell Hall.

Section of Statistics

R. A. BRADLEY, *Chairman*
W. E. COOK, *Vice-Chairman*
C. Y. KRAMER, *Secretary*
W. A. HENDRICKS, *Section Editor* (1954)

FRIDAY, MAY 7, 1954 — 9:00 A.M. — ROOM 243, CABELL HALL

9:00 Introductory Remarks of the Chairman.

1. 9:10 Three Decision Tests of Difference Between Two Means.
D. B. Duncan; *Virginia Polytechnic Institute.*

2. 9:35 On a New Method of Analyzing Extreme-High Value Data.
Julius Lieblein; *National Bureau of Standards.*

3. 10:10 Some Duplex Methods of Using Desk Calculators in Statistics.
M. C. K. Tweedie; *Virginia Polytechnic Institute.*

4. 10:35 On a Problem in Fitting a Straight Line.
W. S. Connor; *National Bureau of Standards.*

5. 11:10 Some Topics in Variance Component Analysis.
W. A. Thompson, Jr.; *Virginia Polytechnic Institute.*

6. 11:35 Business Meeting.

12:00 Noon-1:00 P.M. — Junior-Senior Scientist Hour — Auditorium, Cabell Hall.

FRIDAY, MAY 7, 1954 — 2:00 P.M.

7. 2:00 Statistical Analysis of Insonation Effects on *Escherichia Coli.*
Miss Patricia Ripley, M. C. K. Tweedie, and D. Thompson; *Virginia Polytechnic Institute.*

8. 2:25 A Minimization Program.
J. B. Jordan; *U. S. Air Force.*

9. 3:00 Optimum Transportation.
M. DiCarlo-Cottone; *U. S. Air Force.*

10. 3:35 Automatic Programming.
Miss N. Coplan; *U. S. Air Force.*

11. 4:10 Some Aspects of Abnormality of the Distribution of t.
J. C. Layman and R. A. Bradley; *Virginia Polytechnic Institute.*

12. 4:35 Analysis of Pastural Data in Three by Three Latin Squares with Rows and Single Observations Missing.
N. R. Thompson and C. Y. Kramer; *Virginia Polytechnic Institute.*

SATURDAY, MAY 8, 1954 — 9:00 A.M.

13. 9:00 Some Aspects of Statistics in Canada.
G. L. Edgett; *Virginia Polytechnic Institute and Queens University.*

14. 9:25 A Two by Two Factorial with Paired Comparisons.
R. M. Abelson and R. A. Bradley; *Virginia Polytechnic Institute.*

15. 9:50 Testing One Sample Hypothesis Against Another.
Lionel Weiss; *University of Virginia.*

16. 10:25 Current Research in Livestock Estimating.
H. F. Huddleston; *U. S. D. A.*

17. 11:00 Some Problems of Optimum Sampling.
P. N. Somerville; *Virginia Polytechnic Institute.*